RHODE ISLAND AREAWIDE WATER QUALITY MANAGEMENT PLAN

INVENTORY REPORT

MARINAS TASK

Prepared Pursuant to Title II, Section 208,
Federal Water Pollution Control Act Amendments of 1972

for the

RHODE ISLAND STATEWIDE PLANNING PROGRAM

Contract No. 77-28

August 1977

RAYTHEON COMPANY
OCEANOGRAPHIC AND ENVIRONMENTAL SERVICES
RAYTHEON

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265 MELROSE STREET
PROVIDENCE, RHODE ISLAND 02907

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ABSTRACT

This report was prepared to provide data for the determination of the importance and magnitude of marina related activities as a source of non-point pollution in the Rhode Island 208 area.

A detailed investigation of literature pertinent to the problem has been completed and included in the report as an annotated bibliography. A complete inventory of marinas, coves and harbors subject to heavy concentrations of pleasure boats has been examined and selected data from federal, state and local governments are presented.

A separately-bound packet of Rhode Island coastline maps depicting freshwater and marine marshes adjacent to the Rhode Island coastline and Block Island is included with the report. Present and proposed water quality standards for marine waters and the locations of discharges as prepared by the Rhode Island Department of Health are also shown on the maps. Information pertaining to point source discharges may also be found in Appendices A & B.

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SECTION 1

SYNOPSIS OF RECREATIONAL BOATING IN RHODE ISLAND

This section reviews literature on the economic impact of recreational boating in Rhode Island, as well as the impact of marine pollution on other recreational and commercial uses. The literature review was performed by examining various documents which are relevant to the two areas of investigation. One of the most useful studies for this review is the Marinas and Pleasure Boating Facilities Study, and because of that, the summary of its findings and conclusions is reproduced here, although not in its entirety. Other studies have been capsulized and summarized to indicate their scope and their relationship to the areas of investigation.

ANALYSIS OF THE ECONOMIC IMPACT OF RECREATIONAL BOATING IN RHODE ISLAND

One of the most up-to-date and relevant studies of recreational boating in Rhode Island was prepared by the Urban Design Group, Inc. and Economics Research Associates for the Rhode Island Department of Economic Development in 1975. Entitled Marinas and Pleasure Boating Facilities Study, the study analyzed the suitability of various sites for marina development, the market support for new facilities, estimated the potential for new facility development, and made a preliminary impact assessment of a large scale increase in pleasure boating facilities in Narragansett Bay.

Inventories were made of existing boating facilities at twenty-five specific locations. The inventory indicated a total of 5,361 dockage spaces, 2,474 moorings, and 4,437 winter storage spaces. A total of 1,042 new dockage spaces are planned. The largest concentration of pleasure boating facilities is on Greenwich Bay, in East Greenwich and Warwick, with a total

capacity for about 3,000 boats. Major harbors, with their total dockage and mooring capacities, are:

Apponaug Cove	1,168
Warwick Cove	1,108
Warren River	714
Newport Harbor	703
Greenwich Cove	673
Wickford Harbor	603
Bullock Cove	554
Sakonnet River	545
Bristol Harbor	451
Edgewood	371

Potential new marina sites were investigated in the Bay, concentrating on identified harbors, basins and anchorages. Four categories were identified as possible locations for new sites:

Developed Existing Harbors, such as Newport Harbor

Undeveloped Existing Harbors, such as Bristol Harbor

Surplus Military Land, such as Melville Basin or Allen Harbor

Remaining Shoreline

Vacant or under-utilized waterfront land at 33 locations was investigated and evaluated according to the following criteria: Availability of land; compatibility of surrounding land use; suitable existing zoning; navigability of water; protection from climate exposure; support infrastructure capability.

Eight sites were estimated to be <u>suitable</u> for development of new marina facilities; nine sites were estimated to have <u>limited suitability</u> for marina development, or to be suitable if certain modifications of evaluation criteria could be made; and seven

sites were estimated to be potentially suitable, depending on actions or decisions by others that could not be estimated by the study. These sites are summarized in Table 1.

State-of-the-art marina projects were investigated, and it was determined that there were five basic ancillary activities associated with commercial marinas: Residential, Boat Sales, Retail Center, Hotel-Restaurant, Boat Yards, Variations.

The study indicated that public support of boating activities has increased as the boating population grows.

Recent pleasure boating studies were reviewed to assess the present environment for development of new facilities and current plans that would affect marina development. Studies of the Rhode Island and Massachusetts marina and boat yard industries indicated that Rhode Island charges for berthing space were around 25% lower than Massachusetts. The majority of boats in Rhode Island (53%) are between 16 ft. and 26 ft. in length, and the second largest group (34%) is between 26 ft. and 40 ft. The trend of sizes of boats berthed in Rhode Island indicates that the 16 ft. to 26 ft. group is the largest growing, and 70% of planned expansion (in 1974) is to accomodate this group. In 1973, Rhode Islanders owned a total of 21,733 boats, 54% (14,920) of which were registered, compared to an estimated 1973 supply of 6,300 berthing spaces. Income for marinas is derived from the following sources, with the highest profit ratio being from summer berthing:

Summer berthing	9-20%
Winter storage	9-10%
Repairs	12-20%

TABLE 1

SUMMARY OF POTENTIAL NEW MARINA SITES AS DESCRIBED IN MARINAS AND PLEASURE BOATING FACILITIES STUDY

SITES DEEMED SUITABLE FOR DEVELOPMENT OF NEW FACILITIES

Allen Harbor (Spinks Neck)
Greenwich Cove
Edgewood
Bristol Harbor
Sakonnet River (Portsmouth)
Melville Basin
Jamestown Harbor (Taylor Point)
Brush Neck Cove

SITES ESTIMATED TO HAVE LIMITED SUITABILITY FOR MARINA DEVELOPMENT

Dutch Island Harbor
Allen Harbor (Dump Site)
Greenwich Cove
Warren River
Kickamuit River
Bristol Harbor
Sakonnet River (Tiverton)
Jamestown Harbor (Fort Wetherill)
Newport Harbor(Newport Waterfront)

SITES DEEMED POTENTIALLY SUITABLE (DEPENDENT ON ACTIONS OR DECISIONS BY OTHERS)

Wickford Harbor
Apponaug Cove
Bullock Cove
Coddington Cove
Coasters Harbor
Newport Harbor (Brenton Cove)
Sakonnet Harbor

New boat and engine sales	10%
Brokerage fees	2- 8%
Ship's stores	13-22%
All other sources	16-27%

Analysis of recent regional market trends in pleasure boating indicated that New York and New Jersey residents are putting strong demands on Connecticut boating facilities, and that Connecticut-owned boats flow into Rhode Island and Massachusetts. Rhode Island residents, on the other hand, own more boats than are registered in the state, indicating that about 2,500 Rhode Islanders keep their boats in some other state, or do not register their boats.

Projected boat ownership trends for boats over 16 ft. in Southern New England indicated that there will be an increase of 8,700 boats from 1975-80, 9,900 boats from 1980-85, and 11,200 boats from 1985-90. Rhode Island has a potential capture rate of 10% to 20% of the boats over 16 ft., indicating the following increase in demand for berthing space in Rhode Island:

1975-80	390 to 780 boats per year
1980-85	440 to 880 boats per year
1985-90	500 to 1000 boats per year

The distribution of boats berthed in Rhode Island marinas is 54% between 16 ft. and 26 ft. (20% sail, 80% power), 34% between 26 ft. and 40 ft. (30% sail, 70% power), 7% over 40 ft. (21% sail, 79% power). The largest increase is in boats between 16 ft. and 26 ft.

Analysis of the demand for slip space in Rhode Island between now and 1990 indicates that there is an immediate demand for 1,200 to 1,600 new berthing spaces. From 1976 to 1980, the demand will be for 390 to 780 new slip spaces annually (1,950 to 3,900), from 1980 to 1985 it will be for 440 to 880 annually (2,200 to 4,400), and from 1985 to 1990, for 500 to 1,000 new slips annually (2,500 to 5,000). Thus, between 1975 and 1990 there is a market potential to absorb a minimum of 7,850 and a maximum of 14,900 new slips total, compared to 5,360 now existing. The variation is primarily dependent on whether Rhode Island's capture rate of new boats owned by residents of other states is 10% or 20% of the total projected boat ownership growth.

The estimated additional slip capacity in Narragansett Bay is 975 to 2,200 slips at "suitable" sites, 150 to 1,900 at "limited suitability" sites, and 400 to 2,200 at sites "dependent on actions by others". The total estimated expansion potential at sites evaluated is a minimum of 1,525 and a maximum of 6,300. The low estimate is enough to meet existing demand only, and the high estimate is enough to meet existing demand plus projected demand through 1987 at a low rate of increase in new boats, or through 1981 at a high rate. There are currently plans to construct 1,042 new dockage spaces, enough to meet 65% to 85% of immediate demand.

There are strong indications that 200 slips is the minimum acceptable size for a new commercial marina to be economically viable. The most profitable, and usually better quality, recently developed marinas are often combined with other uses and are carefully planned and managed. For the marina component, about 3 to 4 acres of land area and 6 to 7 acres of water area is required for a full service 200 slip marina. A 400 slip marina would require 6 to 7 acres of land area and 13 to 14 acres of water area. A 600 slip marina would require 9 to 10

acres of land area and 19 to 20 acres of water area. Development costs average approximately $1,500 to $2,000 per slip for a small boat marina, but this figure can vary enormously, depending on the following major cost elements: Channel dredging, basin dredging, shore protection, land costs, sewage disposal systems, access roads, breakwaters.

There are a broad range of associated uses which may be appropriately developed with a marina, either as a subservient use or as a primary use with a marina only as one component. The most likely ancillary use developments in Narragansett Bay are: Boat yards, boat sales, hotel, retail/commercial, residential, or variations.

Sites identified as having some marina development potential were analyzed to determine ancillary use potential, based primarily on zoning, surrounding land use, and accessibility. Most Narragansett Bay potential marina sites were estimated to have limited flexibility in developments of marinas with significant ancillary use complexes due primarily to zoning restrictions.

Potential adverse effects on the environment from large scale pleasure boating facilities in Narragansett Bay may result from three sources: Boat operations, marina development, or activities by tenants in a marina. While conclusive evaluation of environmental impacts can only be made on the basis of specific proposals, it seems likely that an increase in well-sited, well-designed marinas would not have unacceptable adverse effects on the environment. Boat operations may result in adverse environmental effects in five principal areas: Engine operations, marine toilet discharges, spillage or litter by boat operators, noise from boat engines, and leaching of copper from bottom paints. Most of these adverse effects, are generally considered controllable. Marinas can be a potential source

of adverse environmental effects, but a recent URI study indicates that, in some situations, marshes and marinas are compatible and may complement each other. For existing marinas, undesirable activities can be controlled by the marina management, eliminating most adverse environmental effects by restricting:

Disposal of effluent
Disposal of rubbish
Spillage of oil
Fouling of ground by animals
Noise (radios, engines, animals, children, etc.)

The marina industry in Rhode Island generates about $12.5 million impact on the state's economy, of which about $6.3 million is personal income. A marina in itself will mainly have subtle economic benefits. Employment will be created both during construction and after completion. Construction of a 400 slip marina would involve approximately 28 man-years of employment. Operation of one 400 slip marina would provide 4 year-round and 12 seasonal jobs. With more mixed-use development or ancillary uses associated with a marina, the economic impact becomes significantly greater. The multiplier effect of expenditures on marinas would benefit a broader scope of the community than those directly associated with it. Marina development would increase expenditures on marine-related products and on related goods and services. A significant amount of this expenditure (36%) would come from out-of-state patrons of Rhode Island marinas. State and municipal revenues would be derived through real estate and sales taxes, or from lease income if the facility were publicly owned.

Infrastructure support for marinas required from municipal services falls mainly in the categories of security, utilities, and transportation. Security required in a marina includes police, fire and medical services. Most of these can, and should, be met by the marina management and staff, but some demands may be placed on local services. The maximum level of development of new marinas anticipated should not place unserviceable demands on water, electrical or telephone services, and the costs of providing such service would be borne by the marina developer or tenant. The area in which stress on local capacity might occur is in sewage disposal, particularly as marine toilet pump-out stations become more common. New marina development would affect existing transportation networks through increased traffic on local streets between major arteries and new marina sites. Whether this increased traffic level would be unacceptable or not is dependent on the nature of activity along impacted streets and existing traffic levels on those streets.

OTHER STUDIES AND REPORTS

The Ecology of Small Boat Marinas by Scott W. Nixon, Candace A. Oviatt, and Sharon L. Northly, published by the graduate school of oceanography at the University of Rhode Island, provides an analysis of the ecology of a marina and marsh area in Rhode Island. The authors found that both marina and marsh areas were generally ecologically similar, providing a diverse and productive habitat for existing communities.

Analysis of data for parameters studied in these areas shows that there are significant differences in values which may be attributable to the presence of the marina.

Copper levels in sea lettuce, sediments and fouling communities were higher in the marina than marsh. This is probably a result of copper leaching from bottom paints. The concentration of copper in water, sediments, and organisms is likely a function of the number of boats in the marina and the flushing capacity of the harbor. The levels of copper observed were not consistent at higher trophic levels, e.g., fish.

In a preliminary sport fish survey, the catch per hour was higher in the marina. One species (menhaden) appeared to avoid the marina area. Reasons for this avoidance are unknown, however, menhaden are highly sensitive to changes in environmental parameters.

Growth of fouling communities was faster in the marsh area and resultant biomass was greater. This was due primarily to increased barnacle growth. The authors speculate that the slower growth observed in the marina area could have been due to copper inhibition and/or low oxygen levels at night. Oxygen levels were shown to be lower in marinas than adjacent areas. It was also pointed out that sediment respiration was higher in the marina than in the marsh.

In a preliminary laboratory bioassay, motor exhaust water was shown to be toxic to some marine organisms.

The authors indicate that acute and chronic effects of copper, hydrocarbons and exhaust production on survival and reproduction of estuarine species remain almost unknown.

Although some aspects of marina and marsh communities were not studied, e.g. plankton species composition, shellfish, waterfowl, mammals, this study is clearly an important focal point for the direction and development of future research. Considering

the projected growth of boating and marinas in Rhode Island, this type of research is certainly necessary for the development of guidelines that serve the interests of both the public and the marina industry.

In a Boat Waste Survey of Potter Cove, Rhode Island (1968) by Santo A. Furfari and James L. Verber, significant conclusions relating boat waste to fecal contamination of the surrounding waters could not be drawn. The authors felt that boat wastes were the primary source of pollution, but other sources were present, i.e., cows, sea gulls, bay water.

Although the authors state that "Potter Cove is a satisfactory study area for boat wastes. Its hydrographic characteristics serve as a model for other studies.", they also go on to say that "It is evident from this and other studies that sampling in the vicinity of a small number of boats produces erratic results with limited interpretive usefulness regarding population equivalents." Within the framework of this study, then, Potter Cove was not suitable for the collection of interpretable data. In addition, the number of people and the number of toilets available on board the vessels present was estimated from available literature. Given the usually small number of boats present, it would have been relatively easy to ask each boat owner for specific information.

The authors suggest that usual methods for analyzing coliform data are not applicable for boat wastes and recommend the utilization of other collection methods and sampling by tidal stage.

In Rhode Island Marinas and Boat Yards 1970, a study by Niels Rorholm and Sidney Feld at URI found that boat registration data in 1970 was erratic, but that growth trends were perceptible at marinas and boat yards. Based on data available from previous surveys, a 5.7% annual growth rate of boats berthed at marinas was found between 1962 and 1967. A 10% annual growth rate occurred between 1967 and 1970. Of the boats kept in the coastal zone, 54% were kept at marinas and boat yards, 28% were kept at private moorings and 18% were kept at non-profit organizations such as yacht clubs and state facilities. The number of boats kept in the water amounted to 65% of the total number of boats registered, but also included boats registered in other states but kept in Rhode Island. The inclusion of these boats causes the 65% figure to be high.

The average marina in 1970 had a capacity of only 90 boats in slips and 36 at moorings. The recent expansion in capacity reported was accomplished primarily by introducing new dock configurations utilizing existing land and water resources. It appeared at that time that future expansion would be contingent upon acquisition of adjacent shore line, some dredging and break-water construction, although surveys indicated that a lack of capital was the main constraint on expansion and they questioned the profitability of heavily capitalized expansion. The study estimated that the $8 million gross business of commercial marinas and boat yards generated an additional $6 million in economic activity in Rhode Island.

A study by Robert Kelly and Niels Rorholm, An Analysis of the Rhode Island Marina Industry, published by the College of Resource Development at the University of Rhode Island, examined the "health and characteristics of the firms for which revival depends on continued public participation in boat-based water

sports." The study's purpose was to examine demand for marinas. The focus of this work was strictly on commercial marinas and boat yards with no attention being given to non-profit clubs or state facilities. The results of the study are based on a survey of 69 firms. The variables examined in this study are: marina's business organization and ownership, the services and facilities they provide, employment, summer berthing and winter storage, expansion both past and present, and gross incomes. The survey showed that there were 6,313 berths for recreational craft during 1972 kept at 69 Rhode Island marinas, which were estimated to represent 95% of the business. Over one-third of these marinas handled less than 50 boats. More demand pressure was reported on summer storage capacity than on winter storage capacity. Attempts to increase capacity were not all successful. Of the 1,700 berths planned between 1970 and 1973 surveys, only 1,033 were built. This meant an average annual expansion of 355 spaces as compared to the peak average annual expansion of 750 spaces for 1967. Expansion of winter storage was not held to be so much of a task since 41 firms reported having surplus land for which only minor land-clearing and grading would be required in preparation for winter storage. Gross income was said to have increased $2.5 million since the previous study to $10.7 million. It was estimated that 36% of this income came from out-of-state residents.

The study indicates that while Rhode Island's population increased 10% over the 10-year period, the estimated number of boats increased 77%. Meanwhile, the increase in the number of berths was 70% in the same period. New slips were the primary means of increasing capacity (107%) while the number of moorings actually decreased (-10%). The average size of boats increased only slightly while average seasonal costs more than doubled.

A thorough investigation of the marine manufacturing industry is provided by W. Robert Patterson in the New England Marine Industry: A Study of the Marine Manufacturing and Service Companies published by the New England Marine Resources Information Program and the New England Aquarium, 1971. Even though little is said directly about marinas, much of the discussion is related to factors influencing marina utilization. The study described the marine industry in New England, compares it with national figures and examines market trends; one of which is recreation, including pleasure boating and sport fishing. The study concludes that there is a growing demand for marine recreation, including boating. The study further examines the small marine manufacturing companies and its managements problems, and provides conclusions and recommendations for the future of the industry.

According to Recreational Boating in the Continental United States in 1973, prepared by the US Coast Guard with the assistance of Chilton Research Services of Radnor, Pennsylvania, which surveyed boat ownership and registration to compare number of boats per a state's population, the total boats owned by residents of Rhode Island in 1973 was 27,733. Only 14,290 (54%) boats were registered that same year, and only 6,300 berths were available at Rhode Island marinas. The apparent discrepancy is due to the registration laws which require that only boats having motors be registered and also to the fact that these are boats owned by residents and are not necessarily kept in the state. The survey goes on to show that 33% of the boats in New England have no power and therefore, need not be registered, and that 55% of all the boats owned in New England are less than 16 ft. in length.

A paper prepared by the Marine Advisory Service at the University of Rhode Island, "A Guideline for the Allocation of Berths at Galilee", suggests "criteria for establishing priorities" at crowded ports. Suggested criteria are: amount of

employment generated, amount of income generated, and available alternative berths. Each criterion is discussed and related to boat characteristics.

Donald W. Adie's Marinas - Working Guide to Their Development and Design (Cahners Books, Boston, 1975) is a comprehensive treatment on marina operations and planning. The book deals primarily with the physical aspects of boating facilities, and also presents economic criteria for marina operations. The National Association of Engine and Boat Manufacturers (NAEBM) in its The Modern Marina also discusses the economics of marinas. Financial data received from 190 American marinas was refined into a gross income by source chart of an average American marina. An examination of the gross income distributions indicates that there is no dominant revenue producing function in a marina. Some of the variances are attributable to the types of marinas chosen in each of the studies. NAEBM went further in their income analysis and produced a profit ratio percentage chart which identifies the net profit centers after deducting costs of labor, materials and other charges specifically incurred by the function named. Summer berthing is the dominant profit producer after costs, but again, caution should be used in drawing conclusions since the NAEBM sample includes many parts of the country where longer boating seasons exist.

Several aspects of marina operations are discussed in Seven Points on the Marina Business by Dr. Niels Rorholm of the Department of Resources Economics at URI. The seven points discussed are: accounting systems, customer relations, increasing costs, boat taxes, reduced growth in boating, boat yard expansion and pollution. The last point discussed many of the tradeoffs between marina expansion and environmental quality.

A small pamphlet put out by the Rhode Island Development Council called Boating in Rhode Island is a directory of all yachting and boating facilities in the state. Fees, repair facilities and fuel prices are listed for all sites. Another description of marina facilities in Rhode Island can be found in A Cruising Guide to the New England Coast by Duncan and Ware (Dodd, Mead & Co., New York, 1975).

Proceedings of the 1971 Marine Recreation Conference are described in a report on the 1971 Marine Recreation Conference: Boating in New England edited by James J. Napoli. One of the more important and frequently discussed issues was the environmental and specifically, the water quality problems posed by marina development. Specifically cited are the difficulties boats and marinas will have in meeting the national standards for the treatment of onboard sewage disposal by the EPA. The general troubles within the boating industry are discussed as well as boaters' perceptions of deficient marina services. There is a discussion about pollution which recommended stock storage procedures for marinas. In addition, there were sessions discussing coastal zone resource planning, boating safety education, taxes, and a discussion of future directions for recreational boating during the 1970's.

The 1973 conference on boating in New England is described in A Report on the Second Recreation Conference Boating in New England, 1973, edited by Bruce J. Cole. The various presentations at the conference are summarized and central issues are highlighted. Some of the key points raised are: marinas are not the pollutors many people think they are; pollution from outboard motors can be cut by 15%; a great deal of money is being spent for small-craft waste processing systems; some moorings at Little Narragansett do cause problems; marinas are in poor financial condition even though demand for their

services is rising. A number of issues mentioned which are of particular significance to Rhode Island included: the shortage of facilities; the time required for a permit to construct new facilities; thefts; the public image of marinas; the education of boaters; and environmental problems. Finally, an apparently sensitive issue discussed among the participants was the ecology of marinas and the discharge standards imposed by EPA.

The proceedings from the most recent Marine Recreation Conference are summarized in a document entitled Planning for Shoreline and Water Uses, edited by Bruce J. Cole, published by the Marine Advisory Council of URI. Of particular interest is a paper by Dr. William F. Henry on the economic impact of marinas. Dr. Henry presents some preliminary findings regarding marina impacts, the marina's business structure, and mode of operation. Related to the discussion of marinas are papers about the effects of outboards on the environment, effluent controls for boats, and coastal zone recreation in general.

Two studies from other parts of the country should be mentioned. The Development of Marina Del Ray, by George P. Schultz, Margarita P. McCoy and Kevin J. O'Brien for the Coastal Zone Planning and Management Project at the University of Southern California, examines the entire marina development process. The study charts several development stages: the planning stage, which leads to a tentative decision to develop; a second stage, where in-depth economic studies comparing costs and potential revenue are performed; and a third stage where financing the marina development is sought. Each of these development stages is examined in great detail for the Marina Del Ray project. The third stage was complicated by a severe storm damaging both the marina and boats. Even though the study examines a marina

in California, it documents almost all potential problems and development considerations for building new marinas. Since the study takes place in the late 1960's, some of the environmental considerations may be less than sophisticated. Nevertheless, the study does encompass a great many important conclusions.

A comprehensive examination of boating in a specific area is found in Recreational Boating on the Tidal Waters of Maryland, published by the Maryland Energy and Coastal Zone Administration, 1976. Its major findings are: that overcrowding and/or congestion is a problem; that accident rates are not rising; that demand for boating facilities is rising rapidly while supply is not; that boating is a source of pollution; and that agencies involved with boating growth, development and management should be strengthened. Subjects examined include: a general description of recreational boating, including a discussion of environmental quality and stormwater runoff generated by marina development; the relationship of basin capacity to management planning; an analysis of existing boating facilities; the environmental effects of the boating industry; discussion of ecological carrying capacity for recreational boating; adverse effects of boating; shoreline erosion; and degradation of water quality due to human waste and engine emissions. Marina facility site planning is also discussed.

THE IMPACT OF MARINA POLLUTION ON OTHER RECREATIONAL AND COMMERCIAL USES OF THE WATERFRONT

The Report of the Southeastern New England Study, a level B water and related land resources study of the New England River Basin Commission completed in December 1975, presented a strategy for the balanced development of the resources in Boston, Massachusetts, and Rhode Island. The resources management program was produced by a team of federal, state, and regional officials,

local citizens and the scientific community under NERBC's coordination. In the study's Regional Report, recommendations are made for policies and programs for outdoor recreation and marine resources. Among other things, the study recommended developing new recreational boating harbors, encouraging the private sector to provide more recreational opportunities, and forming boating advisory committees. Detailed recommendations were made in the Planning Area Report for Narragansett Bay and Block Island. The study recommended, with regard to recreational boating, constructing an authorized project at Bristol Harbor; maintaining existing navigation channels, developing new channels and boat landings; guiding future development of marinas in 22 localities; and investigating new regional harbors in Narragansett Bay.

Another study, Urban Waters Study, was a special project for the Southeastern New England Study. Boston Harbor, the Providence waterfront, the rivers draining into Narragansett Bay and Block Island Sound, and the Pawcatuck River Basin on the Rhode Island/Connecticut border are all within the study region. Although this area contains only 7% of the land area of New England, it contains over 45% of the population. Increasing urban and suburban development is placing heavy pressure on the region's open spaces, fresh water wetlands, coastal areas, and water resources. The study aimed to establish a rational balance between the development and the conservation of these resources.

The Urban Waters Special Study was a separate component of the SENE plan. It is aimed at the particular issues and problems facing the cities and towns within this region which have waterfronts on rivers or coastal waters. The study covers harbor cities in major metropolitan areas including Boston and Providence; smaller coastal cities and towns including New Bedford,

Fall River, Gloucester, Plymouth, and Newport; and inland cities and towns including Pawtucket and Woonsocket in Rhode Island and Attleboro in Massachusetts. Focusing on a selected number of such cities and towns, the study generalized its findings to formulate guidelines and criteria for treating urban waterfronts within the overall SENE region. The report analyzes the physical, economic, ecological, and legal and institutional issues related to urban waterfronts in the SENE region. This required developing an inventory of predominant waterfront land uses; reviewing water resources for fisheries, wetlands, flood areas and coastal zones in the area; analysis of general population, employment and waterfront land use trends; and a review of the Federal, State, and local governmental programs that exist for waterfront acquisition, improvement and development. Typical issues addressed include: waterfront development priorities; changing demand for urban waterfront land and the need for renewal; public access and recreation on the waterfront; tourism and historic preservation on waterfronts; physical constraints and management of shoreline alteration; and environmental preservation and protection.

In another "level B" study prepared under the auspices of the New England River Basins Commission, entitled People and the Sound: A Plan for Long Island Sound, 1975, the Commission sponsored a project to analyze Shoreline Appearance and Design. This study, prepared by Roy Mann and Associates, Cambridge, Massachusetts, assembled information, delineated problems and needs, and posed solutions for problems relating to shoreline appearance and design. The report, which received national attention, was the basis for another publication, a planning handbook for shoreline appearance and design. The Plan for Long Island Sound also contained recommendations for improving outdoor recreation opportunities in the region.

George L. Seavey's book Rhode Island's Coastal Natural Areas: Priorities for Protection and Management, published by the Coastal Resources Center at the University of Rhode Island, identifies existing shoreline features in Rhode Island needing protection and suggests methods of protection for such areas. The book describes the method to identify endangered areas; various resource inventories; and existing federal and local incentive programs for protecting natural coastal areas, among which are included the programs of the Rhode Island Department of Natural Resources and the Statewide Planning Program. Federal funding, tax incentives, acquisition, regulation and other innovative protection approaches are discussed. Site-specific recommendations are made for salt marsh sites, coastal ponds, scenic cliffs and other areas. The discussion focuses on areas still relatively primitive and not yet developed. To the extent that proposed land uses may encroach on environmentally sensitive area, this analysis provides a guide to methods of protection of such areas.

Another publication of the Coastal Resource Center at the University of Rhode Island entitled Rhode Island's Ocean Sands: Management Guidelines for Land and Gravel Extraction in State Waters by Malcolm J. Grant examines the effects of the mining industry on Rhode Island's economy and possible damage to marine life. A management program to deal with possible problems is presented and legislation to regulate mining in Rhode Island's waters is proposed. The impact of marine mining on boating in general and other forms of aquatic recreation is discussed. Conflicts between navigation, fishing, and various recreational activities are mentioned, but no specific reference to marinas is made.

In Factors Related to Beach Use, Irving A. Spaulding, URI, the author discusses the socio-economic characteristics of people using Rhode Island beaches and the benefits they receive. The results of this study are based on site interviews. Various characteristics such as age, group size, and household status, etc., are analyzed. Information as to preferences for certain beaches is presented as well as measures of beach attractiveness or unattractiveness.

A thorough study of the available information on barrier beaches in Rhode Island is provided in Rhode Island's Barrier Beaches: Volume 1 by Stephen B. Olsen and Malcolm J. Grant, again published by the Coastal Resources Center at the University of Rhode Island. The focus of the study is the preservation of Rhode Island's barrier beaches through sound management practices. The study traces the geological processes forming the beaches, then analyzes their ecology. The ecological analysis is fairly detailed and site-specific, and reference is made to other detailed analyses. After describing the natural biological processes of the beaches, man's influence is presented. Various consequences of development are examined and detailed listing of tools for controling the consequences of overuse are cited. Future marina construction may encroach on these beaches, making the conclusions of this study relevant.

A companion study, again by Stephen B. Olsen and Malcolm J. Grant, Rhode Island's Barrier Beaches: Volume II, published by the Coastal Resource Center at the University of Rhode Island, examines specific barrier beaches, describes their development and prescribes management plans for their sound use. Thirty barrier beaches are identified. Of the beaches studied, 49 percent of the land area is undeveloped, but they are becoming more residential. The legal framework for protecting the beaches is examined as well as patterns of ownership. Specific beaches

are examined in detail in the following towns: Westerley, Charlestown, South Kingston, Narragansett, Jamestown, Newport, Middletown, Little Compton, and New Shoreham. For each beach, factors such as land use, the distribution of ownership, vegetation, hurricane damage and flood levels, and dune crest levels are examined and potential control tools are discussed. Again, no mention of marinas is made, but the detailed inventory can be used to make plans for future marina development complementary with environmental concerns.

Another publication addressing the conflict between expanding demands for shoreline use and conservation of environmental areas is Marine Trades and the Coastal Cities by Malcolm J. Grant, published by the Coastal Resource Center at the University of Rhode Island. This study examines the structure and health of the marina recreation industry, including recreational boating. Several aspects of marine recreation are discussed including projection of future demand, the need for more space, and the current allocation of space. The author points out the fact that marine recreation demand in general has a small influence on development decisions. The overall theme of the pamphlet is that the marine trades should organize and make their needs known. Methods are suggested for the accomplishment of that end.

A recent report on salt marshes, URI Coastal Resources Center Salt Marsh Project Interim Report, published by the University of Rhode Island Coastal Resources Center in 1975 can be used to evaluate future marina growth. The interim report has three objectives: to prepare an inventory of existing salt marshes; to develop a method for evaluating salt marshes; and to analyze the legal aspects of salt marsh development. Each of these objectives is discussed and the extent to which progress has been made is presented.

In Shoreline for the Public, by Dennis W. Ducsik, (MIT Press, Cambridge, 1974), the author presents a handbook of social, economic, and legal considerations regarding public recreational use of the nation's coastal shoreline. THe book provides a description and analysis of the problem of allocating scarce coastal resources among competing uses, its causal factors, and the legal tools that might be employed to achieve policy objectives as they evolve. Included are discussions of the legal regimes governing public and private rights in shoreline areas, and of governmental powers to ensure the availability and accessibility of public open space along the shoreline.

Robert Ditton and Mark Stephens prepared Coastal Recreation: A Handbook for Planners and Managers for the US Department of Commerce, National Oceanic and Atmospheric Administration in 1976. The Handbook provides a source document for relevant information, identifies recreational concerns in the coastal zone, presents a conceptual framework for coastal recreation planning and management and provides some management strategies and decision guidelines. Selected state coastal programs are highlighted as examples of this methodology and coastal recreation in Rhode Island is discussed in moderate detail, with the notation that lack of good, public access to the shore constitutes a major recreation problem in the state.

An article in the October 1976 issue of Sail Magazine by Michael Matza, "Are We Losing Our Waterfronts? - A Hard Look at Coastal Zone Planning," examines many of the controversies and issues presently at hand in coastal zone management. Each of the issues are examined from the point of view of both the marina operators and environmentalists. Marinas are finding it more difficult to operate under the increasing number of regulations and rules they must obey. Yet environmental considerations must be taken into account. These issues are

examined in California, the Great Lakes, and the Gulf Coast. Finally, the controversy is examined from the point of view of national boating organizations and suggestions are made for the future.

Finally, an article in the May 26, 1977 Boston Globe, "N.E. Power Wants a Nuclear Plant, the Town Doesn't", by William B. Hamilton, illustrates the current controversy involved in the decision whether or not to build a nuclear power plant in Charlestown, Rhode Island. Clearly, the development of power plants at coastal sites will preempt them for marina or other forms of recreation development. Thus, the article presents both the objections to coastal development and the conflicts between competing shoreline uses.

An MIT publication, Coastal Zone Management: Focus on New England; An Annotated Selected Bibliography, compiled by Barbara Passero and Mary Jane Steele compiles published reference material by certain categories: coastal ecosystems, physical processes of the coast, open spaces for public recreational use, supply and demand of coastal resources, opportunities for beneficial use, actual and potential adverse effects of human intervention in natural systems, and planning and management for the coastal zone.

The Coastal Resources Management Council Plan: Policies and Regulations, prepared by the Coastal Resources Management Council, includes a series of plan elements, each of which addresses a specific area or activity. The "Policies and Regulations" statement is developed from the plan elements as they are prepared. Definitions regarding marine recreation i.e. piers, docks and wharves, and harbors, port facilities, and marine transportation were "reserved for future study". Policies regarding marine recreation were stated as follows: 1) "The

Council recognizes the value of the coastal region for recreation activities of many kinds. The Council is also aware of the need for increased opportunities for public access and recreation in the coastal region," and 2) "The Council shall permit recreational development in those instances which makes the best use of scarce shorelines, which does not interfere with the public right of access to the shore, and which does not damage valuable natural areas or scenic vistas. The Council recognizes the great demand for pleasure boating facilities. It shall permit only those facilities which do not significantly disturb valuable areas of contribute to pollution of water bodies."

The State Land Use Policies and Plan, prepared by the Rhode Island Statewide Planning Program, sets forth a statewide land use policy and plan for Rhode Island for the next twenty years. The stated purpose of the plan is "to guide future land use and development by recommending policies and allocations of areas to various uses", including those for coastal areas or shorefront. It established a goal for the shore region to "preserve, develop, and where possible, restore the resources of the coastal region in order to benefit from its variety of assets".

In addition, the Plan for Recreation, Conservation and Open Space, also prepared by the Statewide Planning Program and the Rhode Island Department of Natural Resources, presents the State's guide plan for recreation, conservation and open space. It deals primarily with publicly owned and/or operated recreation facilities, and in regard to pleasure boating facilities addressed only launch ramps, estimating that approximately 108 public and private ramps now exist in the State and that approximately ten additional ramps

would be needed by 1990.

Finally, The Bay Islands: A Marine Recreation Plan for the State of Rhode Island, prepared for the Citizen's Advisory Committee on Island Parks, by the URI Coastal Resources Center in association with the Departments of Natural Resources, Community Affairs and the Statewide Planning Program is a plan for the development of the Narragansett Bay Island Park. It details the ideas, objectives, specific sites, funding sources, and implementation strategy for the creation of the Park. Stress was placed on maintaining the natural and scenic aspects of the islands, preserving fragile and valuable wildlife habitats, and providing access for recreation activities.

SUPPLEMENTAL STUDIES AND REPORTS

Nece, R.E., and C.R. Knoll. 1974. Flushing and Water Quality Characteristics of Small-Boat Marinas. Technical Report No. 40. University of Washington-Department of Civil Engineering.

In this report the authors suggest that future coliform counts be correlated with daily precipitation to better identify sources. The authors also point out that "under the assumption that regulations will effectively limit discharge of human wastes from boats in the marina, the presence of pollution as evidence by coliform levels in a marina will depend on the location of the marina with respect to nearby pollution sources."

Mack, Walter N., and Frank M. D'Itri. 1973. Pollution of a Marina by Watercraft Use. Jour. WPCF 45 (1).

In a study of a Lake Michigan marina, the authors reported a slight increase in the number of coliforms in slips most frequently used by yachts. They suggest that the observed fluctuation in bacterial count probably resulted from uncontrolled factors i.e. temperature, wind, waves, and outside sources. The concentrations of bacteria reported were far below standards for total body contact established for Michigan intrastate waters.

Farrington, John W., and James G. Quinn. 1973. Petroleum Hydrocarbons in Narragansett Bay. 1. Survey of Hydrocarbons in sediments and clams (Mercenaria mercenaria). Estuarine & Coastal Marine Science. 1, 71-79.

The authors indicate that hydrocarbon contamination of sediment and clams (M. Mercenaria) likely resulted from small oil spills in West Passage and the Providence River and the discharge of sewage effluents. They suggest that efforts to reduce occurrence of large accidental spills be accompained by efforts to reduce small spills by sewage effluents, storm sewers, industrial effluents, tanker-shore transfer areas and small craft operations.

Bowerman, Frank R. and Kenneth Y. Chen, 1971. Marina Del Rey; A Study of Environmental Variables in a Semi-Enclosed Coastal Water. University of Southern California. Sea Grant Program. Los Angeles, California. Pub. No. USC - SG-4-71.

This report presents results of examination of current environmental conditions of the marina and of the investigation of the potential sources of contamination from the surrounding environment. A Chapter contains detailed analytical methods pertaining to chemical analysis. Another chapter contains results of the analysis of storm water,

water samples, and sediments of the marina. Conditions seem to be satisfactory at this time. In general, levels of toxic substances such as pesticides and heavy metals are relatively low in water, except for the presence of high levels of lead in both water and sediment.

Compton, J.L., and R.E. Ditton. 1975. A Feasibility, Management and Economic Study of Marinas on the Gulf Coast. Texas A&M University Sea Grant Program. TAMU-SG-76-201. College Station, Texas.

Presents result and conclusions from a series of interviews with 29 public and commercial marina operators along the Texas coast. Chapters consider the effects of restricted supply of marinas, profitability, construction costs, location factors, environmental controls, physical planning, management constraints, economic impacts and others. The report identifies and explains problems restraining marina developments during the present period of increasing pressure for more boat mooring facilities.

Giannio, Steven P., and Hsiang Wang. 1971. Engineering Considerations for Marinas in Tidal Marshes. College of Marine Studies. University of Delaware. Newark, Delaware.

Describes the economic, social and natural values of estuarine settings in which marinas are placed, with an emphasis on coastal marshes. After a brief review of negative environmental impacts of developments in these settings, the document examines problems, impacts and potential solutions for locating marinas in a marsh environment. The report is concluded with a composit marina design which would permit a marina to be constructed in a marsh system yet retain or even enhance its environmental value. However, the design

is not tested.

Mitre Corporation. 1975. Guidelines for the Environmental Impact Assessment on Small Structures and Related Activities in Coastal Bodies of Water. For the US Army Corps of Engineers, New York District. The Mitre Corporation. McLean, Virginia.

Presents information to assist in the identification and analysis of impacts related to permit applications for riprap; bulkheads; groins; mooring piles, dolphins, and ramps; dredging; outfalls; submerged lines and pipes; and aerial crossings. For each of the above headings there is a detailed definition, description of main uses, analysis of construction methods, and a hypothetical composite case study describing typical impacts. Tables and information permit analysis of magnitudes based on the size of the project. A detailed description of environmental factors (air, water quality, noise, ecology, flooding, etc.) precedes the impact assessment segments and several useful appendices on erosion, runoff, water and air quality and navigation conclude the report.

Roy Mann Associates, Inc. 1974. Recreational Boating Impact: Chesapeake and Chincoteague Bays Part 1: Boating Capacity Planning System. Draft. Prepared for the Maryland Coastal Zone Management Program. Maryland Department of Natural Resources. Cambridge, Massachusetts.

Examines the problems of boating congestion and environmental effects resulting from recreational boating activity and facility construction in Maryland tidal waters. A literature review is conducted to determine the state-of-the-art in knowledge pertaining to boating effects on the environment, effects of facility construction, and environmental and

recreational carrying capacities. Chapters consider boating operational and spatial requirements, use conflicts, aesthetics, biophysical impact analysis, and a boating capacity planning system. An extensive bibliography organized in ten subject categories concerning boating and boating impacts is also presented.

SECTION 2

RHODE ISLAND MARINAS

Recent pleasure boating studies have shown an increase in the number of boats, docking space and services offered. Three such studies dealing with the Rhode Island 208 area have been used to aid in the inventory of marinas and boating activity.

The first study, Marinas and Pleasure Boating Facilities Study, by the Urban Design Group, Inc. and Economics Research Associates, analyzed the suitability of various sites for marina development and the market support for new facilities. This report also estimated the potential for new facility development and made a preliminary impact assessment of a large scale increase in pleasure boating facilities on Narragansett Bay.

Boating in Rhode Island summarized all marinas, yacht clubs, and state dockage space available in Rhode Island. This report prepared by the Rhode Island Development Council (presently the Department of Economic Development) while outdated (1973), is still used by many boat owners in the area.

The third study, Neils Rorholm's publication, Boats and Their People, A Study of Rhode Island Boat Owners, examines some of the economic and social questions behind boating. The study discusses boat owners satisfaction with marinas and the services offered by them.

The inventory presented in this report (Table 1) utilizes information from the above publications in an attempt to quantify the number of boats, moorings, slips and types of services offered. Personal visits to a few of the marinas and harbors were used to verify information contained in the reports.

TABLE 1 MARINA INVENTORY

Area	Facility	Slips	Moorings	Fuel: Ramps	Fuel: Gas	Fuel: Diesel	Services: Repairs	Services: Railway or Lift	Services: Marine Store	Services: Electricity	Services: Propane	Services: Ice	Services: Water	Services: Toilet	Services: Trailer	Services: Provisions Nearby	Services: Beverage	Services: Telephone	Services: Toilets	Services: Parking	Services: Restaurant Nearby	Services: Motel Nearby	Services: Storage	Services: Laundry	Services: Showers	Services: Nearby Beach	Pump-Out Facilities: Present	Pump-Out Facilities: Planned
Westerly	Avondale Boatyard	40	28	X	X	X	X	X	X	X			X	X			X	X	X	X	X	X	X	X	X			X
	Frank Hall Boatyard	50	10	X			X	X	X	X			X	X			X	X	X	X	X	X	X	X	X			
	Lotterville Marina	75		X	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X			
	Westerly Marina	100	0	X	X		X	X	X	X			X	X		X	X	X	X	X	X	X	X	X	X			
Watch Hill	Watch Hill Boatyard	50	30	X	X		X	X	X	X			X	X	X	X	X	X	X	X		X	X		X			
	Watch Hill Docks	12	0		X					X				X			X	X	X	X	X							
Charlestown	Shelter Cove Marina	40	0	X	X	X		X	X	X				X	X	X	X	X	X	X	X	X	X						
	Coonn House & Marina	90	3	X	X		X		X	X			X	X	X	X	X	X	X	X	X	X	X		X	X		X	
Point Judith Salt Pond	Salt Pond Marine Railway	30	0	X	X	X	X	X	X	X			X	X			X	X	X	X	X		X		X	X		X	
No Published	Newport Marina	104	0	X	X		X		X					X			X	X		X	X		X					
	Skip's Dock	3	3							X				X	X	X	X		X	X	X	X						
	R.I. Marine Services	50	30	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X			
	Snug Harbor Marina	50	0		X	X			X	X			X	X	X	X	X	X	X	X	X	X			X		X		
	Long John's Marina	35	0	X			X		X	X			X	X			X	X	X	X	X	X						X	
	Ram Point Marina	75	12		X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X		X				
	Stone Cove Marina	150	0	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X				
	Long Cove Marina	30	0	X									X				X	X	X	X	X	X	X						
	J.L. Shellfish Co.				X	X							X	X			X	X		X		X							
	R.I. State Pier #3	150	0		X	X				X			X	X	X	X	X	X	X	X	X	X						X	
	R.I. State Pier #4	5	0							X			X	X	X	X		X	X									X	
	R.I. State Pier #5	7	0							X			X	X	X	X		X	X		X	X						X	
	R.I. State Pier #6	40	0							X			X	X	X	X		X	X									X	
Narrow River	Middlebridge Marina	37	0	X	X				X	X			X	X	X			X	X	X	X	X							
Dutch Island Harbor	Dutch Harbor Shipyard	0	85		X		X	X		X			X	X	X		X	X			X	X	X			X			
	State Coast Moorings	0	8																										
Plum Point/Saunders-town	Plum Beach Club	0	25																										
	Saunderstown Y.C.	0	20																										
	Plum Point Moorings	0	15																										
Allen Harbor	Quonset-Davisville Y.C.	26	28															X											
	Navy Piers	8	0																										
Wickford Harbor	Wickford Marine & Supply	25	2		X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X			X			
	Wickford Cove Marina	180	42		X	X	X	X	X	X			X	X			X	X	X	X	X	X	X		X				
	Wickford Shipyard	137	0	X	X	X	X	X	X	X			X	X			X	X	X	X	X	X	X	X	X	X			
	Wickford Y.C.	0	4																										
	Pleasant St. Wharf	48	15	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X	X	X				
	Johnson's Boatyard	45	22	X			X	X	X	X				X			X	X		X	X	X	X	X				X	
	Private Moorings	0	100																										
Greenwich Cove	Arnold's Boat Shop	49		X	X		X		X	X				X		X	X			X	X	X	X					
	East Greenwich Marine	75	0							X			X	X				X		X	X								
	East Greenwich Y.C.	83	150	X	X			X		X				X			X		X	X	X	X	X		X				
	Noxton's Shipyard	190	75		X	X	X	X	X	X			X	X			X	X	X	X	X	X	X		X				
	Harbourside Restaurant	12	0														X	X	X	X	X								
	Private Moorings	0	55																										
Apponaug Cove	Cowesett Marina	320	10	X	X	X	X	X	X	X			X	X			X	X	X	X	X	X	X	X	X				
	Masthead Marina	150	1				X	X	X	X				X	X	X	X	X	X	X	X			X					
	Apponaug Harbor Marina	250	50	X	X		X	X	X	X	X		X	X			X	X	X	X	X	X	X		X				
	Pensug Marina	150	0	X	X		X			X			X	X	X	X	X	X	X	X	X	X	X						
	Private Moorings	0	30																										
Brush Neck Cove	Little Rhody Boat Club	15	0																										
	Saltwater Dock	15	0																										
	Private Moorings	0	45																										
Warwick Cove	Angell's Marina	60	0		X		X			X			X	X			X	X	X	X	X	X	X						
	Warwick Cove Marina	100	5		X			X		X	X		X	X	X	X	X	X	X	X	X		X						
	C-Lark Marina	260	0		X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X						
	Bonza's West Shore Marina	180	0	X			X	X	X	X			X	X			X	X	X	X	X	X	X		X				
	Carlson's Marina	185	0				X	X	X	X			X	X			X	X	X	X	X	X	X						
	Winstead's Marina	125	0										X	X			X	X	X	X	X	X	X						
	Bridge Marina	250	10		X	X	X	X		X			X	X				X	X	X	X	X		X		X			X
	Nick's Bait and Tackle	20	10	X			X							X				X			X	X							
	Warwick Boat Sales	25	8				X	X	X	X			X	X			X	X	X		X	X		X					
	Dorr's Boat Livert	3	15	X	X				X	X			X	X	X	X		X	X	X	X								
	Private Moorings	0	15																										
Pawtuxet Cove	Edgewood Marina	50	0	X			X		X	X			X	X			X	X	X	X	X	X							
	Cirl's Pawtuxet Cove Marina	70	0	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		X				
	Asprey's Boatyard	15	6																										
	Frank Pettis Boatyard	16	9	X																	X	X							
	Private Moorings	0	15																										
Edgewood	Rhode Island Y.C.	12	20	X	X				X	X				X			X	X	X	X	X								
(Sabin Point-Fields Point)	Port Edgewood	120	0	X	X	X	X	X	X	X	X		X	X			X	X	X		X	X	X						
	Parent's Marina	90	0	X	X		X		X	X			X	X			X	X	X	X	X	X	X	X	X				
	Edgewood Y.C.	55	25	X	X			X	X	X			X	X			X	X	X	X	X		X		X				
Providence	Marine Machinery Service, Inc.	0	0	X			X	X	X	X	X			X		X	X		X	X	X	X	X						
	R.I. State Pier #2																				X								
	East Providence Boatyard						X	X	X	X				X			X	X	X	X	X	X							
Bullock Cove	West's Boatyard	25	14				X	X	X	X				X			X			X	X	X							
	Narragansett Terrace Boat Club	25	30	X			X	X	X	X			X	X			X	X	X	X	X	X							
	Cove Haven Marina	230	0	X	X	X	X	X	X	X			X	X			X	X	X	X	X	X	X		X				X
	Lavin's Marina	150	0		X		X		X	X			X	X			X	X	X	X	X	X	X		X				X
	Private Moorings	0	25																										
Warren River	Stanley's Boatyard	220	57				X	X	X	X	X		X	X			X	X	X	X	X	X	X				X		
	Joe's Boatyard	0	0				X										X		X		X	X							
	Sousa's Shellfish	30	0										X					X	X		X	X				X			
	Ressler Marina	20	10																										
	Barrington Y.C.	37	0	X	X	X		X	X	X			X	X			X	X	X	X	X		X		X	X			
	Water St. Dock Corp.	15		X						X				X			X				X	X							
	Private Moorings	0	385																										
Kickamuit River	Kickamuit Y.C.	10	0																										
	Private Moorings	0	75																										
Bristol Harbor	Bristol Marine Co.	8	24				X			X										X	X		X						
	Hawkins and Fales	0	12				X	X	X	X	X			X			X			X	X	X	X						
	State Street Dock	25	0																										
	Prudence Dock	3	0																										
	Castle Restaurant	6	0															X	X	X	X	X							
	Bristol Y.C.	0	12										X						X		X			X					
	Town Church St. Marina	28	0																										
	Rockwell Dock	35	0																										
	Private Moorings	0	300																										
Potter Cove	R.I.D.N.R. Moorings	0	5																										
Sakonnet River	Pirate Cove Annex	0	3	X			X	X	X							X	X	X		X	X	X	X	X				
	Point Boatyard	0	15				X	X	X								X	X	X	X	X	X	X	X					
	Sakonnet Marina	107	0		X		X	X	X	X			X	X			X	X	X	X	X	X	X	X					
	Stone Bridge Boatyard	60	0	X	X	X		X	X	X			X	X			X	X		X	X	X	X	X					
	R.I. State Pier #6	40	0							X				X															
	Standish Boatyard	13	85		X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X	X					
	Riverside Marine	15	0						X	X				X	X	X		X		X	X			X					
	Pirate Cove Marina	100	3	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X	X		X			
	Tiverton Y.C.	0	5											X				X	X	X	X			X		X	X		
	Private Moorings	0	20																										
Coastern Harbor	Navy Y.C.	150	14							X			X	X				X		X	X	X		X	X	X			X
Newport Harbor	The Moorings	9	0							X			X	X			X	X	X	X	X	X	X			X			
	Mathews Boatyard	40	0	X	X	X	X	X		X				X	X		X		X		X	X		X					
	Christie's Landing	24	0							X				X			X	X	X	X	X	X	X						
	Goat Island Marina	300	0		X	X				X			X	X			X	X	X	X	X	X	X		X	X			
	Newport Boat Sales	30	2		X	X	X	X	X	X							X	X	X	X	X	X	X						
	Newport Shipyard	40	100				X	X	X	X				X			X	X	X	X	X	X	X						
	Pier Restaurant	18	0							X			X				X	X	X		X	X	X						
	Treadway Inn	30	0							X			X	X			X	X	X	X	X	X			X				
	Newport Yacht Club	48	0	X	X			X	X	X				X			X	X	X	X	X	X	X		X				
	Bannister's Wharf	30	0		X														X		X	X							
	Bowen's Wharf	10	0					X	X					X			X		X	X	X	X							
	Williams & Manchester	50	0		X	X	X	X	X	X			X	X			X	X	X	X	X	X	X	X		X			
	Goat Island Marina	250	0		X	X				X			X				X	X	X	X	X	X	X	X	X	X			
	Ida Lewis Y.C.	8	3							X			X	X				X	X	X	X	X		X		X			
	Fort Adams	0	9																										
	Brenton Cove Moorings	0	110																										
	Newport Harbor Moorings	0	140																										
Jamestown Harbor	Round House Shipyard	0	15				X	X									X		X		X	X		X					
	Wharton Shipyard	10	70		X		X	X	X	X	X			X			X	X	X	X	X	X	X	X	X				
	Coastal Marine Services	0	30	X	X		X	X											X		X								
	Fort Wetherill	10	10																X		X								
	Conanicut Y.C.	0	35															X	X		X	X							
Sachuest Cove	Private Moorings	0	25																										
Sakonnet Harbor	Fogale Restaurant	20	0		X	X	X		X	X			X	X	X	X	X	X	X	X	X	X	X						
	Private Moorings	0	35																										
Great Salt Pond, B.I.	Block Island Marina	98	0		X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X	X	X	X			X
	Champlins Marina	80	0		X	X	X			X	X		X	X			X	X	X	X	X	X		X	X				
	Payne's Dock	15	0		X	X				X			X	X			X	X	X	X	X	X	X		X				
	Smugglers Cove	9	3		X					X				X			X	X	X	X	X	X							
	Old Harbor Wharf				X					X	X		X	X	X	X	X		X	X	X	X	X						
	Other Yacht Clubs	UNABLE TO CONTACT																											
	Block Island																												
	Brown University																												
	Cove Haven																												
	Port Edgewood																												
	Pawtuxet																												
	Point Judith																												
	Sakonnet																												
	Touisset Point																												
	U.R.I.																												
	Watch Hill																												
	Weekapaug																												
	Westerly																												

Telephone interviews with 95% of the marinas and yacht clubs in the Rhode Island 208 area provided a means of assessing current boating activity in the area.

A few marinas have changed ownership, closed for the season, or temporarily halted operation, consequently, a 100% return from the telephone interviews was impossible.

A total of 151 mooring and docking areas have been identified as existing in the Rhode Island 208 area. These are categorized by type as follows:

CATEGORY	NUMBER
Marinas	94
Yacht clubs	27
Town-mooring areas*	16
Other-including hotels, restaurants, and stores	14

*Private mooring areas exist in sixteen towns along Narragansett Bay. These areas are comprised of mooring spaces in coves and harbors, either rented or sold by the towns and cities.

Many owners moor their boats off of their personal property. These moorings are not included in the inventory because a good estimate of the number of such spaces is not possible to obtain. This results from permits not being required in most cases unless construction of piers or dredging has taken place. In both of these instances, permits are required for coastal alteration and not for actual boat mooring.

The Rhode Island State Department of Natural Resources, Boating Safety Division, registered 27,518 power boats in 1976. In addition, those boats weighing over 5 net tons are registerd with the United States Coast Guard (Providence office). About 815 boats currently exist in this category, but no breakdown of size, use or power exists.

During the 1977 boating season, approximately 9794 boats were docked at marinas, yacht clubs and hotels in the 208 area. The breakdown by type of mooring does not yield an estimate of the kind of power, but does allow the reader to analyze the importance of marinas and yacht clubs, since 1/3 of the total estimated number of boats are moored in these areas. These 9794 boats were found in the following localities

Marinas	7388
Yacht clubs	778
Town-moorings	1188
Other	440

An estimate of the total number of boats which exist in the 208 area can be made by comparing the percentage of sail to power and adding this to the total number of registered power boats. The Marinas and Pleasure Boating Facilities Study gives an estimate that 21% of all boats being used in Rhode Island waters are sail powered. Consequently, an estimated 33.296 boats are owned by 208 area residents (sail boats without engines do not require registration).

The question of pumpout facilities must be considered with over 33,000 boats being owned in the 208 area, and as many as 1/4 of them having the potential for marine toilets on board. There is no question that pumpout facilities will become a necessity. Of the 94 marinas surveyed, only 4 presently have pumpout facilities on line or hooked up with operation beginning next season. Nine marina operators stated they will put pumpout facilities in when forced to and nine marina operators stated they would never install the necessary facilities. Reasons for refusal ranged from: the government cannot enforce the laws they enact; the guy next door will do it, why should I; it is not the marina owners problem but the boat owners; I cannot afford it; to the extreme of; I'll go out of business be-

fore I do what the government wants me to. The remaining operators queried responded with a wait and see attitude.

In general, most owners and operators of marinas and yacht clubs were interested in providing information and were very honest in their answers on pumpouts.

Personal conversations allowed Raytheon the opportunity of examining personal attitudes towards newly enacted laws, as well as re-examining outdated figures.

This inventory is the most up-to-date information on boats and marinas available in Rhode Island.

BASIN AREA, VOLUME, AND FLUSHING RATES FOR TWENTY-SEVEN HARBORS, COVES, AND RIVERS IN RHODE ISLAND WATERS.

For convenience, basin area is given in square yards, square meters, and acres. Flushing rate is calculated on a percentage basis for each area per tidal cycle, and volume is given in cubic meters (Table 2). Calculations for basin volume and flushing rates are shown on the following page.

A. Basin volume was determined by:

1) Preparing an outline of the harbor or cove on ¼ inch grid paper.

2) Determining a scale factor for each chart used, e.g., on a 1:15000 scale map the area of a $\frac{1}{4}^2$ inch grid was calculated to be equal to 16129m^2.

3) Inserting appropriate depths for each grid square (from map).

4) Summing the number of squares for each depth.

5) Multiplying the number of squares for each depth x chart scale factor x .305 (conversion factor - feet to meters).

6) Summing the calculated volumes for all depths. This equals the total basin volume in cubic meters at mean low water.

B. Prism volume is equal to the sum of the number of grid squares in the basin at MLW, multiplied by the tidal range and scale factor.

All flushing rates were calculated for mean tidal amplitudes given in USCG tide tables for 1977.

Flushing Rates for Each Area are Calculated by the Formula:

$$F = \frac{P_V}{B_V + P_V}$$, where P_V = Prism Volume; B_V = Basin Volume.

TABLE 2

AREA	MLW BASIN AREA			MLW BASIN VOLUME (m^3)	FLUSHING RATE %
	yd^2	m^2	ACRES		
Pawcatuck R. (Pawcatuck Pt. to WERI Tower)	3006768	2516124	621.7	2524712	36.4
Watch Hill Cove	130100	108870	26.9	244733	26.1
Point Judith Salt Pond	5611586	4695888	1160.3	6470765	40.7
Plum Point	848063	709676	175.4	1571238	32.0
Wickford Harbor	1767047	1478700	365.4	1832341	48.1
Allen Harbor	481854	403225	99.6	816611	33.6
Greenwich Cove	1276912	1068546	264.0	1844748	41.4
Apponaug Cove	732418	612902	151.4	787703	48.7
Brushneck Cove	250564	209677	51.8	126551	63.6
Warwick Cove	501128	419354	103.6	437814	53.9
Pawtuxet Cove	293931	245967	60.8	380262	45.1
Edgewood	597499	499999	123.5	1392668	33.4
Bullock Cove	578225	483870	119.6	359722	65.4
Warren River	1248002	1044353	258.1	2681023	35.3
Bristol Harbor	1858029	1554836	384.2	5533997	26.0
Kickamuit River	2255076	1887093	466.3	3210380	44.1
Sakonnet River	977073	817634	202.0	5351912	14.9
Fogland Point	327661	274193	67.8	115604	67.9
Sakonnet Harbor	115645	96774	23.9	206613	30.7
Potter Cove	457761	383064	94.7	603112	42.3
Melville Basin	77097	64516	15.9	241047	22.2
Coasters Harbor	366209	306451	75.7	525376	37.9
Newport Harbor	2505640	2096770	518.1	10935784	17.0
Sachuest Cove	481854	403225	99.6	792015	31.4
Dutch Island Harbor	539676	451612	111.6	1139321	29.3
Jamestown Harbor	1349191	1129030	279.0	8567530	12.3
Great Salt Pont (B.I.)	2803024	2345627	579.6	11809171	13.6

SECTION 3

ANALYSIS OF EXISTING AND PROJECTED LAND USE IN THE MARINA STUDY AREAS

Information on existing land use in the Marina Study Areas was obtained from the 1970 computer map of the Rhode Island Statewide Planning Program. Existing land uses in Rhode Island are contained on USGS quadrangle 1:24,000 scale maps prepared by Dr. MacConnell of the University of Massachusetts in 1970 recorded from air satellite photos. That information was then coded to prepare a computer map of existing land uses, based upon a 92 acre unit of analysis. It should be noted however, that the existing land use information is in the process of being updated. The Statewide Planning Program is using 1975 aerial photos to identify land use changes from the 1970 data, and is then field checking those land uses which changed. Once the development of that information has been completed, the Program will update the MacConnell information on computer maps, based on a 10 acre unit of analysis. Although classification schemes are different, the Program has developed a classification for its updated information which allows the MacConnell codes to be interchangeable with the revised information. Tabulations of amounts of acreage in existing land uses by category are available also. Because not all of the revised 1975 maps portraying the Marina Study Areas were available, this analysis relies on the 1970 data and other sources of information.

Existing land use data was also in the material collected for the New England River Basins Commission's Report of the Southeastern New England Study. Completed in 1975, the report used the Mac Connell survey data as well as other sources of information to generate its land use inventory. NERBC developed this information at a scale of 1"=1 mile. This resource information was used to

develop the policy recommendations contained in the report for managing the region's land and water resources. The study region included all of Rhode Island, eastern Massachusetts and a portion of Connecticut. The Urban Waters Special Study, a project for the SENE Study was used to obtain data on Newport Harbor and East Providence. The Urban Waters Study analyzed particular issues and problems facing urban areas within the SENE region which have water fronts on rivers or coastal waters.

A third source of information for this section was supplied by the Marinas and Pleasure Boating Facilities Study, prepared in 1975 for the State of Rhode Island Department of Economic Development. The study analyzed the suitability of some 25 sites for marina development, and the market support and potential for new facilities. It also made a preliminary impact assessment of a large scale increase in pleasure boating facilities on Narragansett Bay.

Finally, some generalizations were made about projected land uses in the Marina Study Areas. This analysis was developed from an examination of the Statewide Planning Program's State Land Use Policies and Plan, prepared in January of 1975. Unfortunately the scale of projected land uses in 1990 was much larger than the scale of information on which existing land uses were portrayed, so that precise comparisons were not possible.

The following discussions contain a summary of both existing and projected land uses in the twelve Marina Study Areas, organized by specific sites.

WICKFORD HARBOR; NORTH KINGSTOWN

Wickford Harbor is one of the more popular and picturesque harbors in Narragansett Bay. Located on the West Passage, its natural protection is increased by a man-made breakwater. The harbor consists of: the outer harbor, formed by the breakwater; Wickford Cove to the south, with the largest concentration of pleasure boating facilities; Mill Cove and Mill Creek to the northwest; and the shallow Fishing Cove to the north. Mill Creek and Fishing Cove are formed by parts of the Navy's surplus Quonset Point Naval Air Station, and are separated by Calf Neck. The shelter from all weather is excellent, as is the surrounding environment; Wickford is an interesting community, with many fine old buildings along the principal street leading to the public dock. Existing land uses in the Harbor area are predominatly light residential, open areas, agriculture and wetlands.

The state's projected land uses indicate continued urbanization around the Harbor, with higher density residential and industrial development along the northern shore.

GREENWICH COVE; EAST GREENWICH/WARWICK

One of four coves opening off Greenwich Bay on the western side of the Bay, Greenwich Cove is a good natural harbor, well protected except from the northeast, with good depth throughout the narrow channel. It is called "one of the best natural harbors on the Bay" by Cruising Guide to the New England Coast. The eastern, Warwick side of the cove is Goddard Memorial State Park. The western side is an older urbanized part of East Greenwich, with a concentration of boating-related activities. The residential area between

the Cove and East Greenwich's main commercial street (U.S. Route 1) is being investigated as a possible historic restoration district by the town's Historic Commission. The water in Greenwich Cove is classified as "Class C" by the R,I. Department of Health--suitable for fish, shellfish and wildlife habitat, recreational boating and industrial cooling. The northwestern shore of the Cove contains an industrial area and a waste disposal area, with scattered commercial sites.

The state plan indicates further concentration of urban development on the western shore, recreation and open space uses on the eastern shore and a regional shopping, commercial center at the Cove's southern-most point.

APPONAUG COVE; WARWICK

This cove in the northwest corner of Greenwich Bay has three large marinas and, as a result, has one of the heaviest concentrations of pleasure boats in Rhode Island. It was dredged in 1963 by the Corps of Engineers as a navigation project. Boating facilities are located between the Penn Central main line tracks and the Cove on the western shore. The remainding land is medium to high density residential. The Cove offers good shelter from all winds. There are plans to dredge the inner cove and provide navigational improvements, but the railroad trestle crossing the Cove will limit use of this area to small, shallow draft boats. On the western shore of Greenwich Bay, just south of the Cove proper, two large marinas with breakwaters are located.

The State Land Use Policies and Plan indicates a rather limited area for proposed urban development by 1990, the predominant land uses consisting of medium density residential, governmental, institutional, and recreational uses.

WARWICK COVE; WARWICK

The eastern-most estuary off Greenwich Bay, Warwick Cove was improved as a navigation project in 1966 by the Corps of Engineers. Its shoreline is residential and the cove has one of the heaviest concnetrations of marinas and pleasure boats in the Bay. Horse Neck and Warwick Neck protect it from all weather patterns, and access is through a marked, narrow channel. Several small coves along both shores are tidal marshes. Most of the boating facilities are older establishments, and the quality and quantity of amenities is rather low.

The projected land uses for the area indicate continued increases in density for residential development in the area, with two predominant open space and recreation areas on the eastern shorefront.

SAKONNET RIVER; PORTSMOUTH/TIVERTON

The Sakonnet River, is the eastern-most passage of Narragansett Bay, between Aquidneck Island and the towns of Tiverton and Little Compton. At the northern end of this passage is a narrow strait at the juncture of the Sakonnet River and Mt. Hope Bay, where the Portsmouth shore is only about 2,000 feet from the Tiverton mainland. This area is becoming one of the most active boating centers on the Bay There are several marinas and a number of private moorings in the area between the Old Stone

Bridge and Common Fence Point. The passage is open to southerly and northerly winds, but otherwise well protected. A strong tidal current runs through the passage. A Cove to the west of the main passage is limited to small boat use due to a fixed bridge at its entrance, and shallow water. Development in the area is mixed, ranging from dense residential development, commercial, summer houses and open space on the Portsmouth side, to a fuel tank farm and other urban development uses in Tiverton. There are three beaches in the area, including Island Park. Also, an extensive mining area exists on the western shore of Old Orchard Cove, adjacent to some wetland areas.

The state's projection for land uses in this area indicate that a limited amount of new, medium density residential development is proposed for the Tiverton side of the river. The Portsmouth side is recommended for woodland and open land uses.

BULLOCK COVE; EAST PROVIDENCE/BARRINGTON

Bullock Cove, on the east side of the Providence River, is formed by Bullock Neck on the west and Allen Neck on the east. A narrow opening with a dredged channel, it offers good shelter and easy access. The cove is dredged to a maintained depth of six feet. Haines Memorial State Park is on the Barrington (east) side, and Crescent Amusement Park is on the East Providence (west) side, at Richmond Point. The remaining land is medium density residential. The area also contains a beach, marinas, and a city park.

Proposed land uses for the area indicate increased residential uses and a recreation area.

WARREN RIVER: BARRINGTON/WARREN

This harbor is located about 2 miles up the Warren River, with most facilities concentrated at Tyler's Point at the junction of the Barrington and Palmer Rivers. Tyler's Point is almost entirely devoted to pleasure boating facilities. The Barrington shore is an upper income residential area, fully developed and includes some recreation uses. The Warren shore is predominantly industrial and waterfront commercial, beginning to show signs of deterioration, although it does contain some significant salt water wetland areas. Two major industries on the Warren side are Blount Marine and American Tourister. The Warren River, with its excellent protection and good buoy marking, is a popular and heavily used mooring area. There is a considerable current in the river, but this does not seen to limit boating activity.

The area is proposed for low and medium density residential development, conservation, and a regional shopping and commercial area.

KICKAMUIT RIVER: BRISTOL/WATER

The Kickmuit is an attractive harbor off Mount Hope Bay, to the east of Bristol Neck. Entrance from the Bay is through the Bristol Narrows, a very narrow, though short, opening between Bristol Neck and Touisset (which is part of Warren). The Bristol side is heavily built up of small, high density residences, mostly summer or second homes. The Touisset

side contains a similar residential area, though not as intensely developed as the Bristol side and includes extensive agriculture uses, open and forest land, and salt water wetland areas. The river is somewhat sheltered from swells and most weather patterns, though it is too large to afford complete protection. The water depth is ample for pleasure boats, particularly offshore, and there are many private moorings in the river. The northern end of the River has considerable marsh area. The Department of Health classified the water as Class "B"--suitable for bathing and other recreational purposes, although at its southern end, near Mt. Hope Bay, the water is classified as a polluted area for shellfishing purposes.

The projected land use for the area includes woodland and open areas, and increasing urban or residential development.

BRISTOL HARBOR: BRISTOL

A large open harbor, Bristol is not particularly well sheltered. It has, however, a long and colorful association with pleasure boating and is one of the most active sailing centers on the Bay, despite a limited amount of shoreside facilities. Poppasquash Neck, which forms the west side of Bristol Harbor, is low density residential, agricultural wetland or open areas and includes Colt State Park. The northern end of the Harbor is salt marsh. The eastern side is the commercial and industrial district of Bristol, which is somewhat underdeveloped considering the amenities offered by its water front location and available land. There is some local interest in rejuvenating the waterfront area and there have been serious recent proposals for marina development. The southeast shore is in agricultural,

recreation and open space uses. Water classification by the Department of Health is Class "B" in the eastern half of the Harbor, although this area is designated as a polluted area for shellfishing.

Projected land use includes low density development on the western shore, open space and recreation on the northern and southern shores and more intensive residential development on the eastern shore of the Harbor.

NEWPORT HARBOR: NEWPORT

There are actually two harbors in Newport Harbor: the main harbor, between Goat Island and the waterfront, and Brenton Cove. The main harbor contains nearly all built-up facilities and a large number of private moorings. It is exposed to prevailing southwest winds, but well protected from all other directions. The water depth ranges from 12 to 22 feet, and is clear of obstacles. The character of the waterfront, including Goat Island, has been undergoing a dramatic transformation and redevelopment in the past ten years, giving Newport the potential for one of the most attractive and active urban waterfronts in New England. Uses of the waterfront include shipyards, marinas, commercial fishing facilities, light manufacturing and water-oriented retail businesses such as restaurants, shops and offices. In addition, luxury housing is being built near the water-front sites. Newport is, of course, and internationally known sailing center, and many waterfront uses are devoted to this activity.

Brenton Cove, the other harbor, is bounded by Fort Adams and Fort Adams State Park on the west and the Newport estate area on the east. There are many private moorings, most of them used primarily for day 'tripping' or overnight visits rather than seasonal storage. Swimming is popular in Brenton Cove, with a Class "B" rating by the Department of Health, while Newport Harbor has a Class "C" rating.

Projected land uses for this area include its continued development as a regional shopping and commercial center, high density residential development, medium density residential along the southern shore and recreation areas to the west. Except for the northern areas of the city's waterfront, little new urban development is expected, other than an increase in density of existing developed areas.

POINT JUDITH SALT POND: NARRAGANSETT, KINGSTOWN

Point Judith Salt Pond was created by ocean waves and currents depositing sand and gravel forming barrier beaches and thereby enclosing what was formerly a small bay. The Pond, with access to the ocean through the Point Judith Pond Breachway, lies within the towns of Kingstown and Narragansett. Development at the southern portion of the Pond consists of the community of Jerusalem, and land uses associated therewith, such as roads, open areas, public beaches, two state piers, a number of marinas, and public boat launching sites, and salt water wetland areas. Along the western shore of the Pond, there are extensive forested areas interspersed with moderate residential development and open areas. The northern shores of the Pond are marked by water based recreation and open areas, a yacht club, and extensive agriculture uses. Most dense residential development is

located on the eastern shore of the Pond, although there are some forested and salt water wetland areas remaining. Along the southeastern shore of the Pond are located Fisherman's Memorial State Park and the Galilee Bird Sanctuary.

The state projects that by 1990, the southeastern area of the Pond will be devoted to commercial uses and the western shore will be more intensively developed as medium residential. Other uses include protecting and maintaining the woodland, open and recreation areas which already exist in the area.

THE GREAT SALT POND: NEW SHOREHAM

Located on the western part and in the middle of Block Island, the Great Salt Pond is characterized by its undeveloped, open and almost moor-like appearance. The extreme western land portions of the Pond consist of open areas, water based recreation areas and, along the northern shore, extensive agriculture uses. There are also scattered salt water wetland areas in this section. The lower, southeastern portion of the Pond is slightly more developed and includes such uses as light residential, some commercial and industrial, and intensive agriculture. This area also contains open land, some water based recreation areas, and salt, as well as fresh water wetland areas. What little development there is in this portion of the Pond, exists because of the development pressure spreading north to New Harbor from Old Harbor, the original Island settlement, and because of the value of the Pond as a natural, protected harbor.

Recommended land uses for the Pond include low and medium density residential development along the southwestern shore near New Harbor, and continuing the recreation, conservation and open areas along the north, east, and western shores of the Pond.

SECTION 4
EXISTING ZONING IN THE MARINA STUDY AREAS

An analysis of zoning districts in the twelve Marina Study areas was performed by examination of zoning maps prepared by the Rhode Island Coastal Resources Management Council. The maps synthesized various zoning information so that a number of towns' zoning districts could be displayed on a single map at a common scale. Although the individual town zoning maps were prepared at different times (ranging from 1970 to 1975), the composite maps were completed by the CRMC in January of 1977. Moreover, while each town may use a different zoning classification scheme and terminology, the zoning districts themselves are roughly comparable. All existing zoning maps are found on file in the offices of the Rhode Island Statewide Planning Program. The following text describes, in summary fashion, the existing zoning for the twelve marina areas; obviously, for site-specific information the actual zoning maps must be examined. Figures in parenthesis indicate the approximate lot size for various densities of residential development.

WICKFORD HARBOR

Zoning in the Wickford Harbor waterfront area, located in North Kingstown, is characterized by scattered commercial zones among high density residential zones. There is a single industrial zone located on the western waterfront, while open space zones are proposed for two northern points in the harbor area and the eastern part of the harbor (Cold Spring Beach).

GREENWICH COVE

Greenwich Cove is located in the town of East Greenwich. Zoning along the waterfront of the cove includes a commercial

district immediately north of the yacht club (also commercial); moving south along the western shore, a high density (6,000 sq. ft. lots) residential zone is immediately adjacent. A medium density (10,000 sq. ft. lots) residential zone is next along the western shoreline with an industrial zone located immediately south of that zone. A high density residential zone is at the southern portion of the cove. The entire eastern shore of the cove is zoned low density residential (30,000 sq. ft. lots), although that area is presently a state park.

APPONAUG COVE

Apponaug Cove, located in the town of Warwick, lies off of Greenwich Bay. The western shorefront area is characterized by highest density residential zoning (7,000 sq. ft. lots), with two sites on the Cove zoned for waterfront business. The eastern shore of the Cove is marked, going from north to south, by a commercial zone, an industrial zone, a high density residential zone (10,000 sq. ft. lots), a highest density residential zone (7,000 sq. ft. lots) extending to Cedar Tree Point, and a medium residential zone (15,000 sq. ft. lots) bordering the Point.

WARWICK COVE

Warwick Cove, also located in Warwick, proximate to Greenwich Bay, is ringed by highest density residential development (7,000 sq. ft. lots). Two waterfront parcels are zoned for waterfront business in the northeastern portion of the Cove. The southeastern shore of the Cove is zoned for medium density (15,000 sq. ft. lots) and low density (40,000 sq. ft. lots) residential development, with two waterfront parcels zoned for waterfront business.

SAKONNET RIVER

The Sakonnet River Marina Study area lies between the towns of Portsmouth and Tiverton. In the Portsmouth area, surrounding Old Orchard Cove, zoning is predominantly low density (40,000 sq. ft. lots) residential, while the area on the southern part of the cove, known as Blue Bill Cove, is zoned predominantly commercial. Moving south along the Portsmouth side of the river, zoning is for the most part, low density residential. On the Tiverton side of the river, zoning is highest density (15,000 sq. ft. lots) residential, commercial, high density residential (30,000 sq. ft. lots) and medium density (60,000 sq. ft. lots) residential at its southern-most portion.

BULLOCK COVE

Bullock Cove is located in East Providence. Although zoning around the cove is limited to high (7,500 sq. ft. lots) or highest (5,000 sq. ft. lots) density residential development, a parcel on the western shore of the cove is zoned open space, and a small parcel is zoned commercial on the eastern shore. In addition, there appears to be some attempt to zone the entire shoreline of the Cove, in spite of the above uses, for open space activity.

WARREN RIVER

The Warren River Marina Study Area is located in the town of Warren. At Rumstick Point, zoning consists of low density (40,000 sq. ft. lots) residential, while at Adams Point, zoning is limited to high density (25,000 sq. ft. lots) residential development. Zoning on the eastern side of the river consists primarily of high density residential development.

KICKAMUIT RIVER

The Kickamuit River runs between the towns of Bristol and Warren. Zoning along the sides of the River is limited to low density (40,000 sq. ft. lots) residential, while zoning at the northern portions of the River consists of high density (10,000 sq. ft. lots) residential development.

BRISTOL HARBOR

Bristol Harbor, located in the town of Bristol, is characterized by low density (40,000 sq. ft. lots) and medium density (20,000 sq. ft. lots) residential zoning on the western and northern shorefront. On the eastern shorefront, the zoning consists primarily of commercial, industrial, and high density (10,000 sq. ft. lots) or highest density (6,000 sq. ft. lots) residential development. The southeastern shore is zoned for low density residential development.

NEWPORT HARBOR

Newport Harbor is probably one of the most urbanized of the twelve Marina Study areas. The zoning in the Harbor area consists of a predominant commercial area (including Goat Island) and immediately adjacent high density (20,000 sq. ft. lots) residential development. On the southern shore of the harbor, the area is zoned for low density (40,000 sq. ft. lots) closer to the commercial areas, and high density residential development in the area to the southwest.

POINT JUDITH SALT POND

Located in the towns of Kingstown and Narragansett, Point Judith Salt Pond is zoned, on the western portion of the pond,

predominantly low density (40,000 sq. ft. lots) residential, open space, medium density (15,000 sq. ft. lots) residential, and two parcels of commercial zones, to the north and south of that area. On the eastern shore of the pond, zoning is much more urbanized. The southeastern shore is marked by commercial, industrial and high density (10,000 sq. ft. lots) residential zones, while the northeastern shorefront is zoned medium density (15,000 sq. ft. lots) residential development.

GREAT SALT POND

Located on Block Island, Great Salt Pond, one of the most rural of Marina Study Areas, is zoned predominantly open space or low density (approximately 40,000 sq. ft. lots) residential development. A single large parcel, located near New Harbor and Harbor Pond, is zoned for commercial activity.

SECTION 5

EXISTING FEDERAL LAWS AND INSTITUTIONS

FEDERAL AGENCIES

The Department of Defense, Army Corps of Engineers

The Corps is the major federal water resources development agency, and its activities involve planning, designing, and constructing works of "improvement" such as dams, levees, harbors, waterways, locks, and other large structures. These works provide flood protection and stormwater management for cities and major river valleys, supply water for municipal and industrial use, generate hydroelectric power, provide recreational opportunities, improve water quality, and enhance fish and wildlife.

The Corps also provides planning assistance to states and other nonfederal agencies for the comprehensive management of water resources. The Urban Studies program of the Corps is designed to develop resource plans for flood control, floodplain and stormwater management, municipal and industrial water supply, wastewater management, bank and channel stabilization, lake estuarine and ocean restoration and protection, recreation and harbors and waterway development.

With regard to controlling pollution from marine development, the Corps enforces laws pertaining to the discharge or deposit of matter into, or dredged from, navigable waters and their tributaries, under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500).

The Environmental Protection Agency

EPA provides grant assistance for activities involving environmental protection and coordinates and supports research and anti-pollution activities by state and local governments, and the private sector. Authority for the conduct of these activities is found in the FWPCA Amendments of 1972 (PL 92-500).

Under Section 208 of PL 92-500, EPA provides grants to state and local agencies for areawide wastewater planning and management.

Section 201 of the Act provides authority for EPA to grant funds, in the amount of 75% of their cost, to state and local governments for the construction of sewage treatment facilities.

Under Section 402, EPA is authorized to establish a National Pollution Discharge Elimination System or a system of permits for the discharge of municipal and industrial waste into the navigable waters of the nation and its tributaries.

Planning grants are also provided under Section 303(e) and Section 209 of the Act, to carry out water resource planning for river basins.

Finally, under Section 312, EPA is charged with responsibility for promulgating standards of performance for "marine sanitation devices".

Department of Transportation, U.S. Coast Guard

The U.S. Coast Guard has major enforcement responsibilities for standards regarding marine sanitation devices issued under

Section 312 of the FWPCA of 1972. The Coast Guard is required to establish equipment requirements conforming to EPA standards, to certify marine sanitation devices, to seek civil penalties and injunctions for violations, and to issue waivers of the standards or regulations where appropriate, for certain classes of vessels or individual vessels. The Coast Guard also has responsibilities under the Ports and Waterways Safety Act of 1972 for regulating vessel traffic and safety and establishing sea lanes. Under Section 311 of the FWPCA, the Coast Guard enforces pollution prevention regulations for oil vessel transfer facilities and operations, (see 42 FR 32670, June 27, 1977). Finally, the Coast Guard carries out a program of emergency operations in coastal waters of the United States.

The Department of Commerce, National Oceanic and Atmospheric Administration

The National Oceanic and Atmospheric Administration administers the programs authorized by the Coastal Zone Management Act of 1972, as amended. Those programs provide funds to states for preparation of plans for their coastal zones and to implement plans, once approved. Section 307 of the Act specifically provides that programs developed under the FWPCA are to be incorporated as the water quality element of coastal zone management plans.

Under Section 302 of the Marine Protection, Research and Sanctuaries Act of 1972, the Secretary of Commerce, through the Director of NOAA is authorized, after consultation with other interested federal agencies to designate as "marine sanctuaries" those areas of the oceans or coastal waters which are necessary to protect conservation, recreation, ecological, or aesthetic values. After such designation, the Secretary obtains certain regulatory powers over activities within the area.

The Department of Housing and Urban Development

HUD administers a program of national flood insurance which includes coastal flood prone areas under the National Flood Insurance Act of 1968 as amended, and the Flood Disaster Act of 1973. Subsidized insurance is provided as long as flood prone communities adopt flood hazard regulations based on minimum federal standards. As of December, 1974, five Rhode Island communities were in the emergency or first phase of flood insurance programs, thus enabling existing structures to receive flood insurance at subsidized rates. Twenty-one communities had been accepted in the regular program and had adopted permanent, appropriate land use and control measures.

HUD also administers '701' or comprehensive planning assistance funds to local communities, which are generally used for land use planning purposes.

The Federal Regulatory Framework

Requirements Under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) PL-92-500 (33 USCA 1251 et.seq.)

Under this section, the Corps of Engineers is directed to administer the issuance of permits for the discharge of dredged or fill materials into the navigable waters of specified disposal sites. Sites are to be selected in accordance with guidelines promulgated by the Administrator of the Environmental Protection Agency. The Administrator is also afforded the right to restrict the use of any selected site whenever he determines, after public notice and opportunity for public hearings, that the discharge of such materials into the selected area will have an adverse effect on municipal water supplies, shellfish beds and fishing areas, wildlife habitats, or recreational areas.

In response to recent court rulings, the area subject to permits for dredge and fill materials has been expanded, consistent with judicial interpretation of "navigable waters", as defined in Section 502(2) of the FWPCA. Interim final regulations prescribing the policies, practices, and procedures to be followed by the Corps in implementing Section 404 were published in the Federal Register on July 25, 1975 (FR No 1. No. 144). As a matter of policy, the regulations seek to build on state regulations for dredge and fill, where they exist. However, through this program the Corps exercises direct regulatory authority over construction work associated with a wide range of public and private development activities.

The permit system established under Section 10 of the Rivers and Harbors Act of 1899 for works of improvement in navigable waters, has largely been incorporated into the Section 404 permit program.

Requirements Under Section 402 of FWPCA; the National Pollution Discharge Elimination System Permit

Persons discharging directly into navigable waters are subject both to effluent standards and water quality standards promulgated under Sections 301 and 303 of the Act. Water quality standards are initially adopted by the states and submitted to EPA for approval; if unacceptable, EPA may establish federal standards for the state. Both the standards and the limitations are enforced through the issuance by EPA of a discharge permit under Section 402, which defines maximum levels of discharge and timetables for compliance. In states with permit programs which meet federal requirements, the state may assume authority to issue federal permits, subject to EPA review and veto. However, in Rhode Island, the

permit program is administered by EPA because the state is without its own program. Such permits are issued both for treatment works and for direct "point source" discharges as part of the NPDES program.

However, a recent lawsuit challenged the exercise of EPA's authority to exclude certain "point" sources from the NPDES permit program. In NRDC v. Train, 396 F. supp. 1393, 7 ERC 1881 (D.D.C. 1975) the Federal District Court for the District of Columbia agreed with NRDC's arguments and required EPA to promulgate regulations extending the NPDES permit system to include all point sources including, among other things, separate storm sewers. EPA has appealed this decision, although proposed regulations have been published (V. 42, N. 24, pp 6846 Federal Register 2-4-77) and final regulations are expected later this year. In the proposed regulations, EPA sought to establish a new program of "general permits" to cover point sources in the category of separate storm sewers. Storm sewers have been defined to include conveyances or systems of conveyances located in urbanized areas primarily operated for the purpose of collecting and conveying stormwater runoff. The use of this "general permit program" is designed to allow flexibility in the issuance of permits, by being implemented in two phases, so as to allow the permits to conform to forthcoming 208 plans and to "general permit program areas" or geographical areas which contain a number of storm sewer "point sources".

Requirements Under Section 312 of the FWPCA; Marine Sanitation Devices

Probably the most important federal regulatory requirement for marina pollution is found in Section 312 of PL 92-500. Section 312 defines a regulatory framework for both EPA and

the Coast Guard to control pollution resulting from vessel wastes. Control of vessel sewage is needed because vessels are mobile and may congregate near shellfish beds, drinking water intakes, swimming beaches or other critical areas and cause harmful contamination. Federal legislation is necessary in this area because there is a need for uniform standards to replace a variety of state laws.

Section 312(b)(1) requires EPA to promulgate "Federal standards of performance for marine sanitation devices . . . which shall be designated to prevent the discharge of untreated or inadequately treated sewage into or upon the navigable waters of the United States". The standards must give "appropriate consideration to the economic costs involved" and must be "within the limits of available technology". Vessels "not equipped with installed toilet facilities" are exempt from the standards.

EPA has promulgated a standard for boats with marine toilets prohibiting "the overboard discharge of sewage, treated or untreated, or of any waste derived from sewage". 40 C.F.R. pt. 140.3 (1976) Federal Register Vol. 41, No. 20 - Thursday January 29, 1976. (see Table 1). The effect of this standard is to require vessels to install holding tanks or similar retention devices. EPA has acknowledged that such retention devices require pump-out facilities and adequate on-shore treatment facilities if meaningful pollution abatement is to occur, since the vessel must have some place to dump the contents of its holding tank. But since the Federal Government has no power under the Act to require marinas or ports to install pump-out facilities for vessel holding tanks, the EPA standard assumes that pump-out facilities will be installed in response to vessel owners' demands once the federal standard takes effect.

The EPA standard has a provision which permits existing vessels with flow-through devices that meet certain effluent standards and are certified by the Coast Guard, to keep those devices after the effective date of the no-discharge standard, provided that the flow-through devices are installed during a specified period before the effective date. Under §312(c), the EPA standard does not become effective for existing vessels until five years after the date of promulgation which is January 30, 1975; the clause of the standard allowing flow-through devices is designed to encourage boaters to install pollution abatement devices before the end of this five-year period or before January 30, 1980. Initial standards under Section 312 are to become effective for new vessels two years after promulgation or on January 30, 1977.

The EPA standards and the Coast Guard regulations pre-empt state laws upon their effective date, and vessels in compliance with the EPA standards before their effective date are exempted from enforcement of state and local laws.

The Coast Guard has three functions to perform under §312: certifying devices that meet the EPA standard, enforcement, and issuance of waivers. Section 312(b)(1) requires the Coast Guard to promulgate regulations "consistent with [the EPA] standards . . . governing the design, construction, installation, and operation" of marine sanitation devices. This requirement is supplemented by §312(g), which prohibits the sale in interstate commerce of any marine sanitation device unless it is substantially the same as a device certified by the Coast Guard to conform to the standards and regulations. Similarly, §312(h) prohibits the sale of any vessel "subject to such standards", i.e., any vessel equipped with a marine sanitation device, and which does not have a waiver; it also prohibits

the operation of any such vessel on the navigable waters of the United States, unless its device is substantially the same as a Coast Guard-certified device. The Coast Guard regulations are contained in 33 CFR 159 et.seq.(41 FR 4622, 41 FR 15324; and 42 FR11;).

Section 312(k) charges the Coast Guard with the enforcement responsibility. Enforcement is by administratively assessed civil penalties and by injunction. Section 312(k) allows the Coast Guard to "utilize by agreement . . . law enforcement officers or other personnel and facilities of the EPA Administrator, other Federal agencies, or the States to carry out the provisions of this section". In spite of this provision, it seems likely that the primary enforcement mechanism will be through the statute's prohibition of sales in interstate commerce of non-conforming vessels or devices.

Section 312(c)(2) allows the Coast Guard to waive the standards and regulations for classes of vessels and individual vessels. It is apparently expected that this waiver authority will be used: EPA, in promulgating its no-discharge standard, conceded that holding tanks are not practicable for some types of vessels and stated that this problem would have to be addressed through the waiver provisions. The legislative history states that the waiver authority is to be used to deal with technological and economic problems that the standards might cause for particular types of vessels. Sen. Rep. No. 91-351, 91st Cong., 1st Sess. 11-12 (1971).

Special No-Discharge Zones

In order to mitigate the effects of federal pre-emption, §312 establishes procedures whereby some waters may be designated as no-discharge areas, in which vessel sewage discharges would

not be permitted even from a vessel permitted to discharge by the federal standard or by a waiver of the federal standard. Two procedures are established. Under §312(f)(3), a state may completely prohibit the discharge of sewage into "some or all of the waters within such State", if the administrator finds that "adequate facilities for the safe and sanitary removal and treatment of sewage from all vessels are reasonably available for such water to which such prohibition would apply".

Alternatively under §312(f)(4), the administrator may completely prohibit the discharge of vessel sewage into "specified waters" of a state which applies for such a regulation. Section 312(f)(3) requires a finding by the state that "the protection and enhancement of the quality" of the waters in question require a complete prohibition of discharge; §312(f)(4) requires the same finding on the part of the administrator.

The Coastal Zone Management Act of 1972, PL 92-583, as Amended by PL 94-370

The purpose of the Act, administered by the Department of Commerce, is to foster more effective and beneficial management, use, and protection of the coastal zone of the United States. The Act authorizes provision of funds to coastal states to prepare and administer coastal zone management programs "to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, dultural, historic, and aesthetic values as well as to needs for economic development" (303(b)).

Section 305 authorizes grants to states for preparation of a coastal zone management program, which must include:

(1) identification of the boundaries of the coastal zone subject to the management program;

(2) definition of what shall constitute permissible land and water uses within the coastal zone which have a direct and significant impact on the coastal waters;

(3) inventory and designation of areas of particular concern with the coastal zone; such as natural or estuarine areas, transition and intensely developed areas where reclamation is needed or where public access should be increased, areas especially suited for intensive use or development, etc.;

(4) identification of the means by which the state proposes to exert control over the land and water uses referred to in paragraph (2) above, including a listing of relevant constitutional provisions, legislative enactments, regulations, and judicial decisions;

(5) broad guidelines on priority of uses in particular areas;

(6) description of the organizational structure proposed to implement the management program, including the responsibilities and interrelationships of local, areawide, state, regional, and interstate agencies in the management process (305(b)).

(7) a definition of the term 'beach' and a planning process for the protection, of, and access to, public beaches and other public coastal areas of environmental, recreational, historical, aesthetic, ecological, or cultural value;

(8) a planning process for energy facilities likely to be located in, or which may significantly affect, the coastal zone, including but not limited to, a process for anticipating and managing the impacts from such facilities;

(9) a planning process for (a) assessing the effects of shoreline erosion (however caused), and (b) studying and evaluating ways to control, or lessen the impact of, such erosion, and to restore areas adversely affected by such erosion.

Under Section 306, grants are provided for implementing and administering the state management program. Before approving a program for funding, the Secretary must find that the program, among other things:

- has been coordinated "with local, areawide, and interstate plans applicable to areas within the coastal zone . . ."
- "provides for adequate consideration of the national interest involved in the siting of facilities necessary to meet requirements which are other than local in nature"
- "makes provision for procedures whereby specific areas may be designated for the purpose of preserving or restoring them for their conservation, recreational, ecological, or esthetic values"
- will be managed by an authority empowered "to administer land and water use regulations, control development . . . and . . . resolve conflicts among competing uses"

Section 307 of the Act, which relates to interagency coordination and cooperation, states that the requirements of the Federal Water Pollution Control and Clean Air Acts, as amended, are to be incorporated in any program developed pursuant to the Coastal Zone Management Act. Furthermore, the Department of Housing and Urban Development has signed an Interagency Agreement with the Office of Coastal Zone Management which requires coordination of Comprehensive Planning Assistance applications with Coastal Zone Management grant applications and provides guidelines for determining consistency between the required land use element of the comprehensive plan and coastal zone management programs.

Section 302(h) of the Act states that "the key to more effective protection and use of the land and water resources of the coastal zone is to encourage the states to exercise their full authority over the lands and waters in the coastal zone, including unified policies, criteria, standards, methods and processes for dealing with land and water use decisions of more than local significance". Provisions for federal funding of coastal zone management programs under Section 306 include a requirement that the program provide for "State administrative review for consistency with the management program of all development plans, projects, or land and water use regulations, including exceptions and variances thereto, proposed by any state or local authority or private developer . . ." (306(e)(c)).

It is clear that the Act intends comprehensive planning to be integrated with state coastal zone planning objectives and land use management strategies to be coordinated with the state coastal zone management plan. In addition to land use regulations pertaining to private development, such as marinas, the state's coastal zone plan should include other environmental strategies. Environmental controls that the coastal programs are to consider include the following: mandatory shoreline ordinances including zoning, sanitary and subdivision ordinances and building permit systems which would control minimum lot sizes, setbacks from the water, vegetation clearing and removing, filling, draining, dredging, and size, location and operation of septic tanks; zoning and subdivision ordinances based on vulnerability criteria; state or regional review of local plans and enforcement measures; coastal wetland alteration laws that prohibit dredging, filling or altering of coastal wetland without a permit; establishing of aquatic preserves where there can be no more

selling, filling or dredging of submerged land for creating waterfront real estate; and regional permit systems for shoreline development.

Amendments to the Act passed in 1976 are specifically designed to assist those states facing Outer Continental Shelf (OCS) oil and gas development or other energy-related developments in the form of grants or loans to coastal states from a new Coastal Energy Facility Impact Fund, authorized at $250 million for three fiscal years. Up to 20% of the fund may be used for planning grants. The Act also provides for automatic grants to be given to any state which is actually landing OCS oil or natural gas in its coastal zone, based on the number of barrels or oil or natural gas equivalent produced, to be used to ameliorate adverse impacts of energy resource development or related facilities. A Federal guarantee for state or local government bonds for such purposes is also provided in the Act.

Funds may be used for planning and carrying out projects in impacted states that are needed to provide new or improved public facilities and public services required as a result of OCS activity. Although such facilities are to be approved by the secretary, they include highways and secondary roads, docks, navigation aids, fire and police protection, water supply, waste collection and treatment (including drainage), schools and education, and hospitals and health care (Section 308(b)(4)(B)(i)&(ii).

Other Federal Legislation

Other Federal laws related to marine and coastal development and which should be noted include: The Marine Protection Research and Sanctuaries Act of 1972; the Deepwater Port Act

of 1974; the Ports and Waterways Safety Act of 1972; the Clean Air Act of 1970, as amended; the Resources Conservation and Recovery Act of 1976; the Toxic Substances Control Act of 1976; and the National Environmental Policy Act of 1969.

A-95 Review Process

Under Section 401 of the Intergovernmental Cooperation Act of 1968, and Section 204 of the Demonstration Cities and Metropolitan Development Act of 1966, the Office of Management and Budget issues OMB Circular A-95 which requires applicants for a wide variety of federal funding programs to submit their applications to statewide and regional "clearinghouses" for review and comment. Applications are circulated among other interested agencies for comments which are to be included in the final application. This process is relevant for marina development only insofar as any marina or proposed construction may be the recipient of any federal aid. Although advisory in nature, the program serves, at a minimum, to notify other interested parties of pending federally assisted programs in the area. Its weakness is that none of the direct federal regulatory programs are subject to A-95 review, although a revised circular soon to be issued encourages federal licensees to submit their projects for review. In Rhode Island, the process is coordinated through the Rhode Island Statewide Planning Program.

STATE AGENCIES

The Department of Health

The Department, through its Division of Water Supply and Pollution Control, administers water quality control programs con-

sistent with requirements under the Federal Water Pollution Control Act. State legislation authorizing water quality programs makes the Director responsible for the adoption of water quality standards, classification of waters, and establishment of a permit system. State and Federal loans and grants to local governments for pollution prevention and abatement are administered by the Department. A permit must be obtained from the Director before discharging sewage into the waters of the state, and no sewage treatment system or other pollution prevention facility can be constructed without obtaining the approval of the director.

The Division of Food Protection and Sanitation, under Title 21 Chapter 14 of the General Laws, is responsible for setting standards and conducting monitoring programs for those areas and activities, including bathing beaches and shellfishing, where human health is of concern. It has the authority to open and close these beds and/or beaches as sanitary conditions dictate.

The Statewide Planning Program

The Statewide Planning Program, a division of the Department of Administration, is the central planning agency for state government. Program activities are assisted by federal grants through the Integrated Grant Administration Program and by direct grants. Preparation and maintenance of the State Guide Plan and coordination of government agency activities constitute the two major areas of program responsibilities. Policy guidance is provided by the State Planning Council, established by executive order and composed of state, local, and federal representatives.

The State Planning Council reviews and adopts elements of the State Guide Plan following public hearings.

The State Guide Plan encompasses a statement of goals and policies for development and a series of functional plans for land use, water supply and sewage disposal, transportation, recreation, economic development, and historic preservation. The update and revision of plans is an ongoing process.

The State Planning Council has formally adopted one component of the State Guide Plan, namely, the State Land Use Policies and Plan. This document outlines recommended land uses within the state and suggests mechanisms for implementation, including strategies for state involvement in growth management at a number of levels of detail. Water quality management plans for all drainage basins are being prepared in accordance with Section 303 (e) and 208 of the Federal Water Pollution Control Act Amendments of 1972, and will become an element of the State Guide Plan.

The Coastal Resources Management Council

The 1971 act (Title 46, Chapter 23) creating a Coastal Resources Management Council gives the council authority in four coastal resource areas: planning and management, implementation, coordination, and operations. The seventeen-member council is composed of the director of the Department of Natural Resources and the Department of Health, members of the legislature, local officials, and public members. Planning and management of coastal resources are the primary responsibilities of the council. Plans and programs formulated for the management of each coastal resource (identifying permitted uses, locations, protection measures) are being developed around basic standards and criteria set forth in the act. These include water quality standards set

by the Department of Health, and consistency with the State Guide Plan.

On the implementation and operational level, the Council is authorized to issue permits for alteration of intertidal salt marshes and any work in, above, or beneath the water areas under its jurisdication (water areas extending from the mean high water mark, seaward to the extent of the state jurisdiction). Thus, the Council's authority is clearly most important regarding marina development. Moreover, the council has limited implementing authority over certain land uses and activities, which are determined by statute to law "a reasonable profitability of conflict with a plan or program for resources management or damage to the coastal environment." Particularly significant uses and activities specified in the act are power generating and desalination plants; chemical or petroleum processing, transfer or storage; minerals extraction and sewage treatment; disposal and solid waste disposal facilities. The council has the authority to approve, modify, set conditions for, or reject the design, location, construction, alteration, and operation of such activities or land uses regardless of their location. Furthermore, it has the power not only to act as a binding arbitrator in any dispute involving public agencies and coastal resources, but also to issue cease and desist orders and to prosecute violators in court.

The Coastal Resource Management Council is also responsible for implementation of programs under the federal Coastal Zone Management Act. Rhode Island received one of the first three grants awarded under the act to assist in development of a coastal zone management program.

The Department of Natural Resources

The Rhode Island Department of Natural Resources, under Chapter 42-17.1 and Chapter 46-1 of the General Laws, has regulatory control over a number of coastal areas. Besides overseeing and managing state coastal parks, management areas and beaches, the Department is charged with regulating freshwater wetlands, many of which are associated with coastal natural areas. The quality of many estuarine areas, in fact, depends on the protection of inland freshwater wetlands. The Fresh Water Wetlands Act gives the Department director the responsibility to approve or deny applications to alter the physical characteristics of certain wetland types.

Under Chapter 42-17.1-2, the Department is to cooperate with RIDOH in the enforcement of laws relating to water pollution, particularly where such pollution may adversely affect fish, shellfish, waterfowl, birds, animals, swimming, boating and recreation. Under Section 48-4-1, the Director of DNR has the power to purchase or condemn land for the constructon of port facilities, while under Chapter 46-22-1 DNR exercises authority to regulate the operation of vessels and motorboats within the state waters.

The Department also undertakes programs to stabilize severely eroded shoreline areas (dunes and barrier beaches), and to cooperate with private landowners in education and land management programs. Its Division of Coastal Resources and Division of Enforcement are used by the Coastal Resources Management Council as staff and enforcement arms, respectively. Under Chapter 42-17.1-4, the Coastal Resources Division processes all CRMC permit applications, and performs engineering reviews, site visits and all related staff functions. Its plan-

ners and biologists cooperate with other Department divisions in an advisory capacity to CRMC. The division carries out those functions of the Department relating to harbors and harbor lines, flood control, shore development, construction of port facilities, and the registration of boats. The Enforcement Division investigates complaints of violations of CRMC regulations and is empowered to issue cease and desist orders where violations are found. Its officers have arrest powers which they may exercise where CRMC cease and desist orders are violated. Department biologists in the Division of Fish and Wildlife investigate and render advisory opinions on applications before CRMC. Other Departmental divisions also routinely review and comment on these applications.

Proposed Department of Environmental Management

In the current session of the Rhode Island Legislature, a bill was passed to reorganize the present state environmental agencies and to consolidate them under a new Department of Environmental Management. The bill, 77-H 6298 (as amended), unifies the agencies responsible for the protection of the human environment, such as DOH, and the agencies responsible for protection of natural resources, such as DNR. The new Department is also to incorporate the staff and, in some cases, the facilities of other councils and boards, such as the Water Resources Board, the Coastal Resources Management Council, and the Solid Waste Corporation. The reorganization is to become effective as of October 1, 1977.

THE STATE AND LOCAL REGULATORY FRAMEWORK

Controls on Development in Coastal Wetlands

Intertidal Salt Marshes: A state law protecting intertidal salt marshes was enacted in 1965 and amended in 1967 and 1969. The act and amendments form Chapter 11-46.1 of the General Laws. The basis of the act is the section of the state Constitution which guarantees the "free right of fishery." Penalties are provided for dumping mud, dirt, or rubbish in a salt marsh or for disturbing the ecology of the marsh by dumping, depositing, or excavating, unless a permit is obtained from the state Department of Natural Resources. The intertidal salt marsh law is administered through a permit program. A violator may be required to restore the marsh to its original condition. An intertidal salt marsh is presumed to exist if any of certain plants grow there and if salt marsh peat is found.

Coastal Wetlands: A state law governing the use of coastal wetlands was adopted in 1965 and appears in Sections 2-1-13 to 2-1-17 of the General Laws. The act is based on the state Constitution's guarantee of the "free right of fishery," on the wetland's value for alleviation of flooding, and on "aesthetic consequences" of despoilation of wetlands. The act declares that it is public policy to preserve the "purity and integrity" of coastal wetlands. A coastal wetland is defined as any salt marsh bordering on tidal waters and on contiguous uplands extending not more than 50 yards inland from a salt marsh, which are necessary to protect the salt marsh. A salt marsh is defined according to the presence of certain plants; the definition is more flexible and inclusive than that used in the act protecting intertidal salt marshes.

The effect of the law would be to restrict the use of coastal wetlands through the exercise of the police power; it amounts to a form of zoning. The Department of Natural Resources is authorized to prepare a written order designating a protected salt marsh and the uses permitted in the marsh. The order, after certain procedures are followed, takes precedence over local zoning and other regulations and permits. The law provides that if an owner of a salt marsh is damaged by such an order, he may claim compensation in the Superior Court.

Rhode Island's coastal wetlands law has not been implemented in the ten years since it was enacted. (In the same period of time, over 23,000 acres have been protected under a nearly identical coastal wetlands program in Massachusetts). A major reason is that the Rhode Island law allows an owner of a coastal wetland damaged by an order restricting the use of his land, to claim compensation in the Superior Court. Damage awards are to be paid from funds appropriated for this purpose or from the Recreation and Conservation Land Acquisition and Development Fund. Since no special appropriations have been made and since the recreation fund is not even adequate for the primary purpose of that program, no action can be taken by the Department of Natural Resources which might result in an award for damages. Therefore, no orders have even been issued. (In Massachusetts, the state has not hesitated to issue orders because the law allows it to modify or withdraw if it is not able to pay damages as set by the court).

Fresh Water Wetlands: Swamps, marshes, and other fresh water wetlands are protected by a state law which was passed in 1971 and amended in 1974. The act is based on alleviation of flooding and on the public interest in the value of those areas for ground water supplies, wildlife habitats, and recreation. The act, also through the exercise of police power, prohibits ex-

cavating, draining, filling, placing certain materials, diverting water flows, diking, damming, changing or otherwise altering any fresh water wetland without the approval of the Department of Natural Resources and the city or town council which has jurisdiction. A violator may be ordered to cease and may be required to restore the area or to pay for the cost of restoration. Fines are also provided for in the law. This act has resulted in an active permit program. An amendment which passed in 1974 provides that if an application is denied, the owner may petition the Superior Court to be paid fair market value for the wetland by the state and/or by the municipality (depending on the denial authority). The court must direct that compensation be paid if it determines "that the proposed alteration would not essentially change the natural character of the land, would not be unsuited to the land in the natural state, and would not injure the rights of others." The legality of the Act was upheld in Mills v. Murphy, 8 ERC 1753 (1976).

The approach of the fresh water wetlands act is total different from that of the coastal wetlands act. Under the former law, the state may protect an area by denying an owner's application to alter it and by requiring a violator to pay a fine and to restore the area. Compensation is paid only under very stringent conditions (in effect, when an alteration is denied which was not in conflict with the objectives of the act and probably should have been approved). Under the coastal wetlands act, on the other hand, protection may routinely involve payment of damages by the state to an owner. The procedures outlined in the two acts are also different. Under the fresh water wetlands act, the state acts on individual permit applications to alter an area, after local approval has been granted. Under the coastal wetlands act, the state issues an order designating the area to be protected and the uses to be permitted.

Land Use Controls

Clearly, the most important controls for marina development are the laws governing land use activities. Rhode Island's land use laws include the following:

Subdivision Regulations, and Zoning Controls: Chapter 45-23, "Subdivision of Land" Chapter 45-24, "Zoning and Ordinances," of the General Laws are two of the most important provisions now in effect to control land use. Both are enabling acts by which the state has delegated to cities and towns much of its power to control land use.

Subdivision Regulations: Chapter 45-23 enables city and town councils to enact ordinances which authorize planning commissions to regulate subdivision of land. Some of the specific purposes of the subdivision regulations are: to provide for traffic, to promote safety from fire and other dangers, development of unsanitary areas for housing, to secure a well-articulated street system, to promote coordinated development of unbuilt areas, to secure sufficient areas in new developments for community facilities, to conserve natural beauty and natural resources, to conform with master plans, to guide public works expenditures, and to facilitate provision of transportation, water supply, sewage, recreation, and other public services.

The law states that regulations "may further provide among other things" for various physical characteristics of streets, utility mains, and other facilities; "for the minimum width, depth, and area of lots; for adequate open spaces..." and for a distribution of population and traffic which will tend to create conditions favorable to health, safety, convenience, and prosperity." The remainder of the law specifies administrative procedures to be followed. Planning commissions

are empowered to accept and enforce bonds in lieu of the actual completion of required work and installations prior to final approval of plats.

Thirty-six communities have enacted subdivision ordinances. Typical subdivision regulations require a developer's plan to be reviewed and approved for their adequacy by the Town Engineer.

Zoning Controls: Chapter 45-24 of the General Laws enables city and town councils to enact zoning ordinances which regulate "the height, number of stories and size of buildings and other structures, the percentage of lot that may be occupied, the size of yards, courts, and other open spaces, the density of population, and the location and use of buildings, structures, and land for trade, industry, residence or other purposes." This was later amended to include ordinances to restrict land use in areas subject to flooding. The council may divide the city or town into districts within which it may regulate the "erection, construction, reconstruction, alteration, repair or use of buildings, structures or land." Regulations may differ from district to district but must be uniform for each type of building within a single district.

The purposes of zoning regulations, which must conform with a comprehensive plan, are generally similar to those of subdivision regulations, with the addition of the provisions "to avoid undue concentration of population; to facilitate the adequate provision of transportation, water, sewage, schools, parks and other public requirements...with a view to conserving the value of buildings and encouraging the most appropriate use of land." Nonconforming uses in existence at the time an ordinance is enacted do not have to be changed. Chapter 45-24 also contains administrative provisions, including the power to impose penalties. The law was amended in 1968 to assure

that adjoining landowners outside the city or town boundary receive notice of proceedings which affect them. Similarly, an adjoining city or town is to be notified if it contains a public or quasi-public water source (or a private water source used for or suitable for public use) within 1,000 feet of an area which is affected by any proceedings.

All but one community in the state has enacted zoning ordinances.

Uniform State Building Code: Under Title 23-27.2 of the General Laws, (Chapter 138 of the Public Laws of 1973) the state has adopted a uniform State Building Code, which became effective July 1, 1977, patterned after the national model. Insofar as the code regulates building practices which may affect marina development, it is a potential marina management control tool.

Proposed Legislation

One of the potentially most significant items of legislation affecting land use in Rhode Island is the State-Local Land Management Legislation. This bill sets up a procedure for the establishment of general standards for local land use regulation; critical area designation; and review of development of regional impact. The bill also substantially increases the ability of local communities to control the development of their land.

The underlying principle of the bill is to relate development of land to its natural capabilities, and to the level of present or proposed public facilities and services. Many non-point sources of pollution are caused by the lack of any land use controls, over development projects on steep slopes, shallow soil areas, and proximity to lakes and streams. This bill, by linking development of land directly to its natural capability,

would allow local communities to minimize the impact of non-point sources of pollution on land use development.

The intent of the bill is::

> To establish minimum standards and procedures for managing land as a natural resource.
>
> To allow the state to express its interest in the few land use issues that are of concern to more than one city or town.
>
> To assure that state agencies' development decisions are consistent with state land use policies and standards.
>
> To assist and guide cities and towns in preparing land management plans and ordinances.
>
> To provide cities and towns with enabling legislation that gives them authority to deal with the full range of land use problems and that allows for diversity and choice of methods.
>
> To establish a mechanism whereby groups affected by a development of regional impact in another community can have their advice considered in that direction.

The land management bill will be enacted, at the earliest, during the 1977-78 session of the General Assembly.

LOCAL AGENCIES

Local Planning Boards

In 1972 an act was passed by the General Assembly which makes it mandatory that cities and towns establish planning boards or commissions (General Laws, Chapter 45-22). The act provides for appointment, membership, compensation, organization, and annual reports of planning boards. It also allows arrangements for technical assistance and for cooperative agreements. Planning boards are required to prepare, adopt, review at regular

intervals, and amend comprehensive community plans. They may prepare other plans, studies, and recommendations. The enabling act states specifically that:

> The comprehensive plan and all elements thereof shall be in general conformity with the goals, objectives, policies, and general arrangements contained in (any) applicable state plan or element thereof.

The planning board or commission is also authorized under Chapter 45-23.1 to establish an official map of the community which identifies the location of streets existing or established by law, and the exterior lines of other streets necessary for the physical development of the town.

Local Conservation Commissions

Local conservation commissions play a role in the use and development of land. Chapter 45-25 authorizes conservation commissions to "promote and develop the natural resources, to protect the watershed resources and to preserve natural aesthetic areas" within the municipality. The conservation commissions advise the various city and town councils, board, and commission on natural resource matters. The commissions may receive gifts of funds, land, buildings and other property in the name of the municipality, subject to the approval of the city or town council and financial meeting.

Zoning Boards of Review

This agency is the municipal agency responsible for the administration for the local zoning ordinance. It grants special permits, variances and special exceptions.

SECTION 6

APPENDICES

Table of Contents

STATE OF RHODE ISLAND
AND
PROVIDENCE PLANTATIONS
DEPARTMENT OF HEALTH
DIVISION OF WATER POLLUTION CONTROL
WATER QUALITY CRITERIA FOR CLASSIFICATION
OF WATERS OF THE STATE
ADOPTED 1967, revised 1973, 1975, 1977

GENERAL POLICY

The following are the criteria of water quality adopted for use in the classification of the waters of the state. In classification of the waters, consideration is given to all factors involved, including public health, public enjoyment, propagation and protection of fish and wildlife, and economic and social development. Classifications are not intended to permit indiscriminate waste disposal or to allow minimum efforts of waste treatment under any circumstances.

In the discharge of waste treatment plant effluents to the receiving waters, cognizance shall be given both in time and distance to allow for mixing of effluent and stream. Such distances required for complete mixing shall not affect the water usage Class adopted but shall be defined and controlled by the regulatory authority.

ANTIDEGRADATION

I. No new discharges permitted into Class A, SA, B, or SB waters. This prohibition shall not apply where it is demonstrated by the applicant to the state that the discharge under most adverse conditions will not impair any usages specifically assigned to the class and the waters will not be degraded below existing classification. Most adverse conditions shall include but not limited to minimum dilution predictable and complete disruption in operation at any treatment system. This prohibition shall not apply to normal stormwater drainage.

II. Waters whose existing quality is better than the established standards as of the date on which such standards become effective will be maintained at such high quality unless it has been affirmatively demonstrated to the Director and after a public hearing that a change is justifiable as a result of necessary economic or social development and will not result in a significant loss of a use presently possible in such waters. Any industrial, public, or private project or development which would constitute a new source of pollution or an increased source of pollution to high quality waters will be required to provide the highest and best practicable means of waste treatment to maintain high water quality. In implementing this policy, the Administrator of the Federal Environmental Protection Agency will be kept advised and will be provided with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act, as amended.

In the review of EPA NPDES permits, no approval will be given unless or until the Director has information on existing water quality for the substances to be discharged.

STATE OF RHODE ISLAND
DEPARTMENT OF HEALTH
DIVISION OF WATER POLLUTION CONTROL

WATER QUALITY CRITERIA FOR SEA WATER

Item	Class SA	Class SB	Class SC
	Suitable for all sea water uses including shellfish harvesting for direct human consumption (approved shellfish areas), bathing and other water contact sports.	Suitable for bathing, other recreational purposes, industrial cooling and shellfish harvesting for human consumption after depuration (restricted shellfish area); excellent fish and wild life habitat; good aesthetic value.	Suitable fish, shellfish and wild life habitat; suitable for recreational boating, and industrial cooling; good aesthetic value.
1. Dissolved oxygen	Not less than 6.0 mg/l at any time	Not less than 5.0 mg/l at any time	Not less than 5 mg/l during at least 16 hours of any 24-hour period nor less than 4 mg/l at any time
2. Sludge deposits-solid refuse-floating solids-oils-grease-scum	None allowable	None allowable	None except that amount that may result from the discharge from a waste treatment facility providing appropriate treatment
3. Color and turbidity	None in such concentrations that will impair any usages specifically assigned to this Class	None in such concentrations that would impair any usages specifically assigned to this Class	None in such concentrations that would impair any usages specifically assigned to this Class
4. Coliform bacteria per 100 ml	Not to exceed a median MPN of 70 and not more than 10% of the samples shall ordinarily exceed an MPN of 230 for a 5-tube decimal dilution or 330 for a 3-tube decimal dilution	Not to exceed a median value of 700 and not more than 2300 in more than 10% of the samples	None in such concentrations that would impair any usages specifically assigned to this Class

SEA WATER (Continued)

	Item	Class SA	Class SB	Class SC
5.	Fecal coliform bacteria/100 ml	(See Note S.9)	(See Note S.9)	
6.	Taste and odor	None allowable	None in such concentrations that would impair any usages specifically assigned to this Class and none that would cause taste and odor in edible fish or shellfish	None in such concentrations that would impair any usages specifically assigned to this Class and none that would cause taste and odor in edible fish or shellfish
7.	pH	6.8 - 8.5	6.8 - 8.5	6.5 - 8.5
8.	Allowable temperature increase	(See Note S.10)	(See Note S.10)	(See Note S.10)
9.	Chemical constituents (See Note S.4)	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the waters for any other uses	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, or impair the water for any other usage assigned to this Class	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, or impair the water for any other usage assigned to this Class
10.	Radioactivity	(See Note S.7)	(See Note S.7)	(See Note S.7)

NOTES: SEA WATER

S - 1 Sea waters are those waters subject to the rise and fall of the tide.

S - 2 All sewage treatment plant effluents shall receive disinfection before discharge to sea waters.

S - 3 The water quality standards do not apply to conditions brought about by natural causes.

S - 4 The waters shall be substantially free of pollutants that will:

a. Unduly affect the composition of bottom fauna,
b. Unduly affect the physical or chemical nature of the bottom,
c. Interfere with the propagation of fish and shellfish,
d. Undesirably alter the qualitative and quantitative character of the biota.
e. The latest edition of Environmental Protection Agency Water Quality Criteria for Water, the latest edition of Water Quality Criteria State of California, and other scientifically acceptable criteria will be used as guidelines in assessing impacts of chemical constituents in the issuance of permits and implementing other water quality improvement programs.

S - 5 Bacteriological surveys of sea waters should include sampling during periods when the most unfavorable hydrographic and pollution conditions prevail.

S - 6 Any water falling below the standards of quality for a given Class shall be considered unsuitable for the uses indicated for that Class. Waters falling below the standards of quality for Class SD shall be Class SE and considered to be in a nuisance condition.

S - 7 The level of radioactive materials in all waters shall not be in concentrations or combinations which would be harmful to human, animal or aquatic life, or result in concentration in organisms producing undesirable conditions.

S - 8 In the case of thermal discharges into tidal rivers or estuaries, where mixing zones are allowed, the mixing zone will be limited to no more than 1/4 of the cross sectional area and/or volume of flow of stream or estuary, leaving at least 3/4 free as a zone of passage. In wide estuaries and oceans, the limits of mixing zones will be established by the Director.

S - 9 As a guide, pending further research, for Class SA waters a fecal coliform criteria of a median value of 15 per 100 ml not more than 10 percent of the samples exceeding 50 per 100 ml and for Class SB waters and a fecal coliform criteria of a median value of 50 per 100 ml and not more than 500 per 100 ml in 10 percent of the samples collected, will be used.

S - 10 Temperature increase: None except where the increase will not exceed the recommended limit on the most sensitive receiving water use and in no case exceed 83°F or in any case raise the normal temperature more than 1.5°F, 15 June through September and not more than 4°F from October through 15 June at the boundary of such mixing zones as is found to be reasonable by the Director.

S - 11 The latest edition of the federal publication Water Quality Criteria will be considered in the interpretation and application of bioassay results. Bioassays will be performed according to the latest edition of Standard Methods for the Examination of Water and Wastewater (APHA).

S - 12 The latest edition of Standard Methods for Examination of Water and Wastewater, APHA, will be followed in the collection, preservation, and analysis of samples. Where a method is not given, the latest procedures of the American Society for Testing Materials (ASTM) will be followed. Other methods recommended by the Environmental Protection Agency (EPA) can be used, if legally acceptable.

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

DEPARTMENT OF HEALTH

DIVISION OF WATER POLLUTION CONTROL

PROPOSED CHANGES IN WATER QUALITY CLASSIFICATIONS - FRESH WATER

River Section	Existing Classification	Proposed Classification
Clear River from Harrisville Dam to a point 1 mile upstream from confluence with Chepachet River (1.4 miles)	C	B
Pawtuxet River from the confluence with the Pocasset River to the Pawtuxet Cove Dam (4 miles)	D	C
Unnamed brook tributary to Pawtuxet River, Warwick (Pawtuxet Village), RI (0.5 miles)	C	B
Saugatucket River from Kingston Road in Peace Dale to the Main Street Dam in Wakefield (1.1 miles)	C	B
Woonasquatucket River from the outlet of Slack's Reservoir to the inlet of Stillwater Reservoir (2 miles)	C	B
Woonasquatucket River from Georgiaville to Greystone Dam Road 0.2 miles north of the Smithfield/North Providence line (1.4 miles)	C	B

PROPOSED CHANGES IN WATER QUALITY CLASSIFICATION - SEA WATER

Area	Existing Classification	Proposed Classification
Upper Narragansett Bay in the vicinity of North Farm on the Bay south of line from the northermost extremity of the breakwater at the North Farm marina easterly to the shore, and east and north of the breakwater at the North Farm marina (5Acres)	SA	SB
The waters in the vicinity of Quonset Point within 1,500 feet of shore from the western end of the carrier pier to		

Area	Existing Classification	Proposed Classification
a point 1,000 feet north of Quonset Point (148 Acres)	SB & SC	SC
The waters in the vicinity of Quonset Point, exclusive of those waters described above, north and east of a line from the southeastern corner of the boundary fence at Electric Boat to General Rock buoy, north of a line from Sauga Point to Buoy (Fl 4 sec)3, north and west of a line from Buoy (Fl 4 sec)3, to Buoy (Qk Fl)13, north and west of a line from Buoy (Qk Fl)13, to Buoy (Qk Fl R)12, west of a line from Buoy (QK Fl R)12,to nun buoy 18 and south and west of a line from nun buoy 18 to a point approximately 3,000 feet north of Quonset Point (459 Acres)	SA,SB,SC	SB
Former SB areas around Quonset Point (296 Acres)	SB	SA
The waters within 1,000 feet of any point on the shore line of Gould Islands (250 Acres)	SC	SA
The waters in the vicinity of Coasters Harbor which are within 500 feet of the Newport marine outfall sewer (18 Acres)	SB	SC
The waters in the vicinity of Taylor Point which are within 300 feet of the Jamestown marine outfall sewer (7 Acres)	SA	SC
The waters in the vicinity of Taylor Point, exclusive of those waters described above, south of a line from the northernmost extremity of Taylor Point to can buoy 13, north of a line from a point of land approximately 1,000 feet south of the Newport Bridge to the northernmost extremity of Rose Island, and within 1,000 feet of the shoreline of Jamestown (49 Acres)	SA	SB
The waters in the vicinity of East Ferry west of a line from Bryer Point to a point approximately 1,500 feet sourh of Narragansett Avenue (61 Acres)	SC	SB

Area	Existing Classification	Proposed Classification
The waters in the vicinity of Wharton's Shipyard which are south and west of a line from a point of land approximately 3,000 feet north of Bull Point to the northernmost of "the Dumplings", and west of a line from the northernmost of the "Dumplings" to a point of land approximately 1,000 feet north of Bull Point (17 Acres)	SA	SB
The waters in the vicinity of South Ferry within 500 feet of the University of Rhode Island Narragansett Bay Campus Marine Outfall sewer (9 Acres)	SB	SC
The waters in the vicinity of Condon Street at Narragansett Pier, Narragansett (28 Acres)	SC	SA
The waters in the vicinity of Tucker's Dock which are within 500 feet of the South Kingstown/Narragansett Regional Sewage Treatment Plant outfall (18 Acres)	SA	SC
The waters in the vicinity of Tucker's Dock, exclusive of those waters described above, which are within 2,500 feet of any point on the shoreline between Continental Road and Hazard Avenue (207 Acres)	SA	SB
The waters in the vicinity of Scarborough within 500 feet of the marine outfall sewer located approximately 2,000 feet, bearing 133° from a point of land at the northern boundary of Fort Nathaniel Greene (18 Acres)	SB	SC
The waters in the vicinity of Scarborough which are more than 500' but less than 1,500' away from the marine outfall sewer located approximately 2,000 bearings 133° from a point of land at the northern boundary of Fort Nathaniel Greene (144 Acres)	SA & SB	SB

Area	Existing Classification	Proposed Classification
Upper Point Judith Pond north of Can Buoy 25 including the Saugatucket River downstream of the Main Street Dam (43 Acres)	SC	SB
The waters in the vicinity of Galilee within 500 feet of the shore from the breachway to a point approximately 600 feet west of Great Island Road (39 Acres)	SA	SB
The waters in the vicinity of Jerusalem within 500 feet of the shore from the breachway to a point approximately 1,000 feet north of the State Pier (23 Acres)	SA	SB
The waters in the vicinity of Snug Harbor within 500 feet of shore from Gooseberry Road to High Point (24 Acres)	SA	SB
The waters in the vicinity of Old Harbor which are within 500 feet of the Block Island marine outfall sewer (12 Acres)	SA & SB	SC
The waters in the vicinity of Old Harbor, exclusive of the waters described above, which are within 1,000 feet from shore from a point 1,000 feet north of the Block Island marine outfall sewer to a point 1,000 feet south of the marine outfall sewer (31 Acres)	SA & SB	SB
The waters in the vicinity of Old Harbor west of a line from the fixed red light at the end of the northern breakwater to the shore at Pebbly Beach which are not included in the SB & SC areas above (23 Acres)	SB	SA

APPENDIX B

DISCHARGES TO RHODE ISLAND SALT WATERS

Discharge No.	Name
000	U. S. Navy, Fort Adams STP*
5	Bristol STP
13	Cranston STP
30	East Greenwich STP
48	East Providence STP
56	Warren STP
64	Westerly STP
72	Blackstone Valley Sewer District Commission STP
85	U. S. Coast Guard Station, Castle Hill STP
100	Pearson Boat Yard STP
131	U. S. Coast Guard Station, Point Judith STP
144	Portsmouth Abbey
169	Sherwood Park
171	Ciba-Geigy Corporation
175	The Hale Mfg. Co.
188	Narragansett-Scarborough Hills STP
242	Portsmouth Middle School STP
264	Palisades Industries
281	Raytheon Co. STP
293	Newport STP
299	Rhode Island Lace Works
315	Providence STP and Combined sewer overflows
323	University of Rhode Island, Marine Campus STP
331	Narragnasett Village STP
341	Newport Electirc Corporation
346	Eastgate Renewal Center STP
358	Elmhurst Elementary School STP
366	Jamestown Sewers
368	Pilling Chain Co.
374	South Kingstown-Narragansett STP
332	Pawtucket combined sewer
404	Quonset Point STP
414	United Wire & Supply Corp.
449	Washburn Wire Co.
493	Narragnasett Electric Co.
636	Peace Dale Sewer
864	Watch Hill Sewer

* SEWAGE TREATMENT PLANT

APPENDIX C

ACREAGE OF RHODE ISLAND SALT MARSHES BY TOWN*

TOWNS	FRINGE MARSHES (ACRES)	OTHER MARSHES (ACRES)	TOTAL ACREAGE
Westerly	7.80	236.69	244.49
Charlestown	6.53	297.09	303.62
South Kingstown	7.17	313.79	320.96
Narragansett	4.00	337.00	341.00
North Kingstown	7.74	192.51	200.25
Warwick	11.12	248.86	259.98
East Greenwich	0.21	2.30	2.51
Cranston	0.01	4.82	4.83
Providence	0.00	3.21	3.21
Pawtucket	0.00	0.00	0.00
East Providence	2.76	83.57	86.33
Barrington	5.65	449.11	454.76
Warren	2.47	239.66	242.13
Bristol	3.61	125.34	128.95
Tiverton	3.14	320.47	323.61
Little Compton	0.22	64.07	64.29
Portsmouth	8.51	437.33	445.84
Middletown	0.15	13.77	13.92
Newport	1.06	35.81	36.87
Jamestown	1.54	138.88	140.42
New Shoreham	2.27	48.20	50.47
Total	75.96	3,592.48	3,668.44

3,668.44 acres = 1,485.72 hectares

*Halvorsen & Gardiner, 1976.

DATE DUE
